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DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID IN FISH RESTORATION

Job Performance Report

Project F-71-R-12

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

Job No. IV-a. Region 4 Mountain Lake Investigations
Job No. IV-b. Region 4 Lowland Lake and Reservoir Investigations
Job No. IV-c^1. Region 4 River and Stream Investigations
Job No. IV-c^2. Region 4 River and Stream Investigations --Miscellaneous Surveys
Job No. IV-d. Region 4 Technical Guidance

By

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February 1989

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JOB PERFORMANCE REPORT

State of: **Idaho**

Name: **REGIONAL FISHERY MANAGEMENT INVESTIGATIONS**

Project No.: **F-71-R-12**

Job No.: **IV-a**

Title: **Region 4 Mountain Lake Investigations**

Period Covered: **July 1, 1987 to June 30, 1988**

No high mountain lake work was performed in Region 4 during 1987.

Author:

Scott A. Grunder
Regional Fishery Biologist

JOB PERFORMANCE REPORT

State of: Idaho Project Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

No.: F-71-R-12

Job No.: IV-b Title: Region 4 Lowland Lake and Reservoir Investigations

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

Anderson Ranch Reservoir

Game fish collected by electrofishing in April 1987 were 116 smallmouth bass, 23 rainbow trout, and 3 bull trout. Smallmouth bass ranged from 55 mm to 415 mm in length, with a mean length of 257 mm. Age and growth analysis of bass revealed the 1981-1986 year classes with an average annual growth increment of 52 mm. The PSD index calculated for bass from the April sample was 44%. A weighted mean Wr value of 104 was calculated for smallmouth bass. Total annual mortality (A) estimated for bass ages 3 to 6 was 0.51. Gillnetting samples of October 1987 consisted of 196 kokanee salmon, 3 bull trout, 2 rainbow trout, 2 smallmouth bass, 1 chinook salon, 7 yellow perch, 9 suckers, and 1 chiselmouth chub. The chinook salmon captured weighed nearly 7.0 kg.

Bray Lake

A total of 11 channel catfish were collected from two experimental gill nets set in August 1987. Number of catfish sampled by gill nets in 1987 was the lowest since 1984, following restocking of Bray Lake in 1983. Poor condition of catfish is attributed to low water conditions of 1987, general lack of cover, and poor forage base.

Cow Creek Reservoir

A total of 527 bridgelip suckers were collected from three experimental gill nets set in early June 1987. Cow Creek Reservoir once supported trout that weighed in excess of 4.0 kg but has not been stocked for over 24 years. Current use is strictly for livestock watering.

Highway 30 Pond

Largemouth bass sampled by electrofishing in August 1987 averaged 282 mm long and ranged from 65 mm to 546 mm. Fifty-nine percent of the sample occurred in the 270 mm to 310 mm length range. Age and growth analysis revealed year classes 1979-1986, which exhibited a mean growth increment of 67 mm. Largemouth bass from this pond appear to display growth rates superior to other reported bass populations in Idaho. A PSD index of 34% was calculated for largemouth bass. A weighted mean W_r of 108 was calculated for bass sampled in August 1987. Total annual mortality for bass ages 3 to 8 was 0.66.

Lake Walcott

Sampling the fish community present in Lake Walcott during 1987 revealed a paucity of available game fish species. Yellow perch were the most prevalent game fish captured both in gill nets and seines, comprising 142% and 65% of samples, respectively. Monitoring of the Lake Walcott fishery will continue into 1988. It is suggested consideration be given to introducing smallmouth bass to the reservoir to supplement the existing trout fishery.

Lower Salmon Falls Reservoir

Ten fish species were caught in horizontal experimental gill nets placed in Lower Salmon Falls Reservoir in 1987. Utah chubs comprised the majority of the sample at nearly 50%, while game fish species comprised 30% of gill net samples. A total of 70 largemouth bass and 102 bluegill were captured while electrofishing in August. Bass averaged 196 mm long and ranged from 42 mm to 415 mm. Age and growth analysis of bass revealed the 1983-1986 year classes which exhibited a mean growth increment of 86 mm, which is superior to documented growth in other Idaho waters. The PSD index for largemouth bass was 41% as estimated from summer electrofishing data. A weighted mean Wr of 108 was calculated for bass. Total annual mortality estimated for bass ages 2 to 4 was 0.64.

Milner Reservoir

Eight fish species were collected from horizontal experimental gill nets in Milner Reservoir in 1987. While nongame species comprised about 90% of the sample, channel catfish appear to be doing well in the impoundment. Catfish averaged 460 mm in length and ranged from 366 mm to 559 mm. Electrofishing will be done in Milner Reservoir in 1988 to assess the success of smallmouth bass stockings.

Ravenscroft Ranch Diversion Ponds

In September 1987, a total of 75 yellow perch, 33 largemouth bass, 30 bluegill, and 11 smallmouth bass were collected while electrofishing. The majority of bass collected were below the 305 mm minimum length limit. The PSD index for largemouth bass was 28%. Fluctuating water levels are thought to be responsible for the marginal quality of the fishery.

Catchable Trout Evaluations

During the period mid-July 1987 to March 1, 1988, jaw-tagged catchable rainbow trout were followed through the fisheries of three regional waters to assess return-to-the-creel. Return rates estimated from jaw tag returns were 23% for Lower Salmon Falls Reservoir, 10% for Milner Reservoir, and 2% for the Snake River near Glenns Ferry.

Creel Survey

Creel survey information was collected from 22 regional waters on the general fishing season opener and 29 locations throughout 1987. Approximately 22,000 hours of effort were expended on Lower Salmon Falls Reservoir during the period June 1 to December 1987, with an overall catch rate of nearly 0.5 trout/h.

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OBJECTIVE

To maintain information for fishery management activities and decisions for lowland lakes and reservoirs.

RECOMMENDATIONS

1. Continue to assess population dynamics of bass stocks and forage fish species in Region 4 waters.
2. Continue fishery and limnology surveys at Lake Walcott and Milner Reservoir. Introduce smallmouth bass to provide additional angler opportunity.
3. Assess return-to-the-creel of catchable rainbow trout in fisheries not yet assessed.
4. Pursue Idaho Department of Fish and Game's purchase of Cow Creek Reservoir to develop a trophy trout fishery.
5. Continue assessment work on status of kokanee population in Anderson Ranch Reservoir and spawning runs up major tributaries.
6. The status of bull trout in the South Fork Boise River drainage should be thoroughly documented to assist in the development of a management plan for wild salmonid populations.

DESCRIPTION OF STUDY AREAS

Anderson Ranch Reservoir

A full description of the reservoir and the fishery was presented by Partridge (1987).

Bray Lake

A brief description of this small irrigation reservoir is found in Grunder et al. (1987).

Cow Creek Reservoir

Cow Creek Reservoir is **a** small impoundment (24 hectares) located in Elmore County, T1S,R11E,S12, which was constructed in 1915. The main dam type is earthfill. The area the reservoir drains is approximately 7.1 km^2 (Idaho Dept. of Water Resources 1981).

The reservoir has not been stocked with trout for nearly 24 years due to loss of access. Historically, rainbow trout in the 1.8 kg to 4.6 kg range were caught. The only current use of the reservoir is for stock watering.

Highway 30 Pond

The Highway 30 Pond (West Highway Pond) is situated on the Hagerman Wildlife Management Area (WMA), Gooding County, Idaho. A full description of the area was presented by Grunder (1986).

Lake Walcott

Lake Walcott was formed in 1906 following completion of Minidoka Dam. A description of Lake Walcott is found in Grunder et al. (1987).

Lower Salmon Falls Reservoir

Lower Salmon Falls Reservoir was briefly described by Grunder et al. (1987).

Milner Reservoir

Milner Reservoir was previously described by Partridge (1987) and Grunder et al. (1987).

Ravenscroft Ranch Diversion Ponds

This series of small ponds was formed during construction of the Ravenscroft Ranch Hydropower Project (FERC No. 4055-002) on the Malad River, T6S,R14E,S29, Gooding County, Idaho. Water surface area and depth varies depending on Malad River flows and upstream irrigation withdrawals.

TECHNIQUES USED

Population Sampling

Several methods were used to sample fish communities present in Region 4 reservoirs during 1987. These included electrofishing, gillnetting, seining, routine creel survey, and fish marking.

Electrofishing

Two different electrofishing boats were used to sample fish populations during this project: (1) an outboard-driven boat equipped with a Coffelt VVP-2C variable voltage pulsator unit powered by a Kawasaki 3,500-watt generator, and (2) a Smith-Root Model SR-18 electrofishing boat powered by a 5,000-watt generator equipped with a Model 5.0 generator-powered pulsator. Generally, sampling was performed using a pulsed DC mode (60 pps, 60% duty cycle) along near-shore areas between dusk and 0300 hours. Sampling effort was recorded in seconds on a control unit meter. All game fish collected were held in a 276-liter recirculating live well until they could be examined. Parameters recorded from game fish were species, length, and weight. Scales were taken from all bass collected.

Gillnetting

Bottom-fishing gill nets were employed in six reservoirs in Region 4 during 1987. Nets were 38.1-m long with graduated square mesh size sections each 7.6 m in length and ranging from 1.9 cm to 6.4 cm in size. Typically, nets were set perpendicular to shore and left overnight. Lengths and weights were recorded from all game fish species.

Seining

A 7.6 m straight seine with 6 mm mesh was used to sample young-of-the-year (YOY) fish present in shallow shoreline areas of Lake Walcott during the summer of 1987. Typically, the seine was hauled a distance of about 30 m, and all fish collected were than identified, counted, and released.

Creel Survey

Conservation officers and other regional personnel recorded information on opening day angler effort and success. Conservation officers also provided information on angler effort and success from random creel checks on Region 4 waters during the rest of the year.

Fish Marking

In 1987, return-to-the-creel of catchable rainbow trout stockings were assessed at Lower Salmon Falls Reservoir, Milner Reservoir, and Snake River near Glenns Ferry. To document return-to-the-creel, a number of fish were jaw tagged per body of water using both regular and reward tags. Size 8 monel tags were used for these projects. Fish were tagged and stocked in mid-July 1987, and their exploitation followed until March 1, 1988. Percent of tags returned during the season was corrected for noncompliance by assessing the difference between regular and reward tag returns.

A total of 8,000 catchable trout received regular jaw tags, while 450 were marked with reward tags. All access areas were posted to solicit information from anglers (Figure 1). Projects received media attention throughout the season to maximize tag returns.

Population Composition and Dynamics

Age and Growth

Impressions of largemouth and smallmouth bass scales were made on acetate slides following procedures described by Lukens (1986). Scales were analyzed on a Micro Design 920 microfiche projector with a magnification of 40X. Only bass collected with electrofishing gear were used in age and growth analyses. Length at age was back-calculated using the Fraser-Lee method with standard y-intercept values of 20 mm and 35 mm for largemouth and smallmouth bass, respectively (Carlander 1982). The equation for the calculation is:

$$L_i = a + \frac{(L_{c-a})}{S_c} \; Si ,$$

Where: L_i = calculated length at age i
L_c = length of fish at capture
a = y-intercept value
S_c = radius of scale at capture
S_i = scale measurement at annulus i.

-

ANGLERS -

These waters contain jaw-tagged rainbow trout. A number of *reward tags* have been placed on trout for which there is a

$5.00 REWARD

***if returned.* Other tags carry no reward. However, if these fish are caught and kept, please remove tags or send tag number, date, location or other information concerning these fish to:**

Idaho Department of Fish and Game

Region 4 Office
868 East Main Street, Box 428
Jerome, Idaho 83338
(208) 324-4359

Your cooperation is appreciated.

Figure 1. Sign posted at access areas along Lower Salmon Falls Reservoir, Milner Reservoir, and Snake River near Glenns Ferry to alert anglers to the presence of jaw-tagged rainbow trout, 1987 to 1988.

Population Indices

Length-frequency data were plotted in 10-mm increments of length. The proportional stock density (PSD) index (Anderson 1976), a measure of stock structure, was calculated using length-frequency data from electrofishing samples. The value, expressed as a percentage, is calculated as:

$$PSD\ (\%) = \frac{\text{number of fish} > \text{quality size}}{\text{number of fish} \geq \text{stock size}} \times 100$$

Stock and quality sizes for largemouth bass, smallmouth bass, and bluegill, respectively, are 200 mm and 300 mm, 180 mm and 280 mm, and 80 mm and 150 mm (Anderson 1980).

The relative stock density (RSD) index was used, when appropriate, to describe the percentage of preferable-size fish in a stock (Wege and Anderson 1978). Preferable largemouth bass are defined as those 380 mm or longer (RSD - 380), preferable smallmouth bass as those 350 mm or longer (RSD - 350), and preferable bluegill as those 200 mm or longer (RSD - 200). This value is:

$$RSD - X = \frac{\text{number of fish} > X\ \text{mm}}{\text{number of fish} \geq \text{stock size}} \times 100$$

where X indicates the size of preferred fish.

The relative weight (Wr) index, a measure of the condition of individual fish, was calculated as:

$$W_r = \frac{W}{W_s} \times 100$$

Where: W = the actual weight of an individual fish
W_s = length-specific standard weight (Wege and Anderson 1978).

Mean W_r values were calculated for 50 mm length groups.

Mortality

Catch curves were generated from age-frequency distributions of populations as sampled by electrofishing gear. Annual survival rates (S) were derived from age-frequency distributions of samples as suggested by Robson and Chapman (1961). Survival rates were calculated for those segments of the age-frequency distribution which appeared to be fully vulnerable to electrofishing. Total annual mortality (A) was simply derived from the formula 1-S (Ricker 1975).

Reservoir Limnology

Limnological parameters, including temperature and oxygen profiles, alkalinity, hardness, conductivity, and Secchi transparency were measured during the summer of 1987 at Lake Walcott, Cow Creek Reservoir, Lower Salmon Falls Reservoir, and Milner Reservoir. Temperature and oxygen measurements were taken with a YSI Model 57 temperature oxygen meter at one-meter intervals from the surface to the bottom. Secchi transparency was measured using a standard 20-cm Secchi disc. Surface water samples were taken at stations and generally analyzed in the field for conductivity, hardness, and alkalinity. Conductivity was measured using a Solu Bridge-type RB conductivity meter. Alkalinity and hardness were measured with a Hach kit.

Zooplankton samples were also collected from the reservoirs. Generally, at least two 5-m vertical hauls were made with a plankton net at each station. Samples were preserved in **95Z** ethanol for later analysis. Organisms were identified to order and enumerated. Results are expressed as percent composition by order.

RESULTS

Anderson Ranch Reservoir

Game fish collected with electrofishing gear in late April 1987 were 116 smallmouth bass (*Micropterus dolomieui*), 23 rainbow trout (*Salmo gairdneri*), and 3 bull trout (*Salvelinus confluentus*). Smallmouth bass averaged 257 mm in length and ranged from 55 mm to 415 mm (Figure 2). The major mode in the distribution occurred between 220 mm and 250 mm. Rainbow trout were not separated according to origin (hatchery vs. wild) but most appeared to be the result of 1986 fingerling plants (F. Partridge, IDFG, personal communication). The three bull trout captured by electrofishing were 270 mm, 310 mm, and 350 mm long.

Two gill nets set on October 7 in the Lime Creek arm and pulled on October 8 captured a total of 196 kokanee salmon (*Oncorhynchus nerka*), 3 bull trout, 2 rainbow trout, 2 smallmouth bass, 1 chinook salmon (*Oncorhynchus tshawytscha*), 7 yellow perch (*Perca flavescens*), 9 suckers (*Catostomus* sp.), and 1 chiselmouth chub (*Acrocheilus alutaceus*). Total lengths were recorded from 146 kokanee (Figure 3). Bull trout were 270 mm, 270 mm, and 310 mm in length, while the single chinook salmon was 807 mm long and weighed 6.7 kg.

Smallmouth bass sampled by electrofishing gear in 1987 were represented by year classes 1981-1986 (Table 1). Back-calculated annual growth increments averaged 52 mm, similar to that reported for Anderson Ranch Reservoir smallmouth bass sampled in 1985 (Partridge 1987).

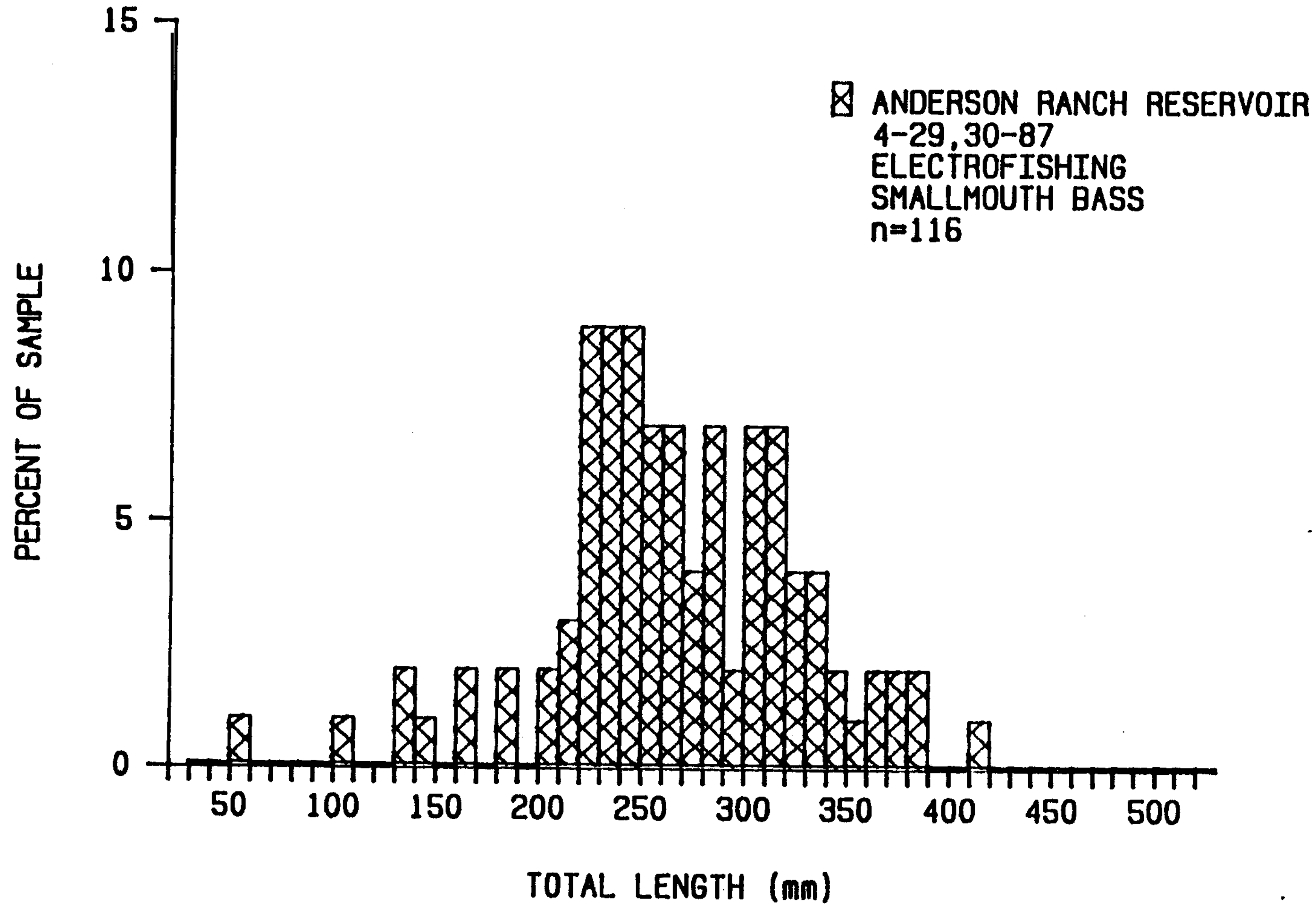

Figure 2. Length frequency diagram of a sample of smallmouth bass collected by electrofishing Anderson Ranch Reservoir, 1987.

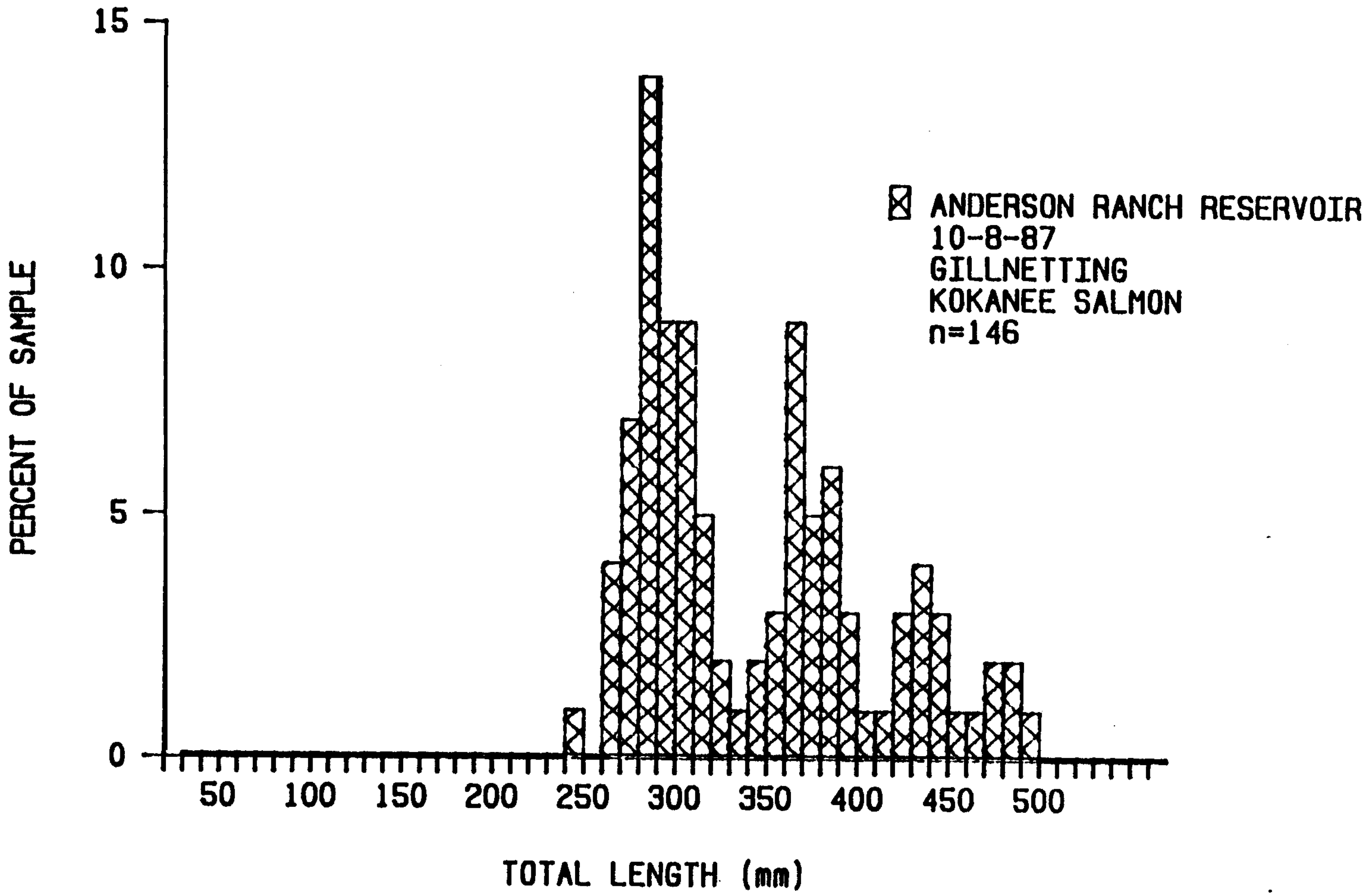

Figure 3. Length frequency diagram of a sample of kokanee salmon collected with horizontal experimental gill nets in Anderson Ranch Reservoir, 1987.

Table 1. Back-calculated lengths at age (mm) from a sample of smallmouth bass collected with electrofishing gear in Anderson Ranch Reservoir, April 28-30, 1987. The correction factor (a) used in the analysis was 35 mm. Standard deviations in parentheses.

Age class	Year class	Number of fish	Mean length at capture	Mean length at annulus (mm) 1	2	3	4	5	6
I	1986	0	--	--					
II	1985	7	142	72 (8.3)	138 (24.1)				
III	1984	26	246	74 (7.0)	149 (20)	242 (24)			
IV	1983	31	266	69 (7.2)	124 (20)	190 (26)	260 (42)		
V	1982	13	292	70 (7.3)	120 (14)	176 (24.4)	238 (34)	288 (47)	
VI	1981	4	316	70 (2.8)	124 (15)	168 (23)	212 (35)	262 (44)	312 (48)
Number of fish		81		81	81	74	48	17	4
Weighted mean length				71	132	204	250	282	312
Increment of growth				71	61	72	46	32	30

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Smallmouth bass from Anderson Ranch appear to exhibit slower growth rates throughout their life span than those in Brownlee Reservoir (Rohrer and Chandler 1985) or the Hells Canyon section of the Snake River (Lukens 1986) (Tables 2 and 3). Annual growth increments sharply decline after age III.

The PSD index calculated for the smallmouth bass population was 44% from the late April electrofishing sample. The RSD-350 index from the same sample was 7Z.

Relative weights calculated for individual smallmouth bass from the electrofishing sample were closely grouped around the optimum W_r of 100 (Figure 4). Mean W_r per 50-mm length group ranged between 80 and 117, with a weighted mean W_r of 104 (Table 4).

Total annual mortality (A) estimated for smallmouth bass ages 3 to 6 was 0.5141 (Figure 5).

Overall electrofishing catch per unit effort (fish/h) for smallmouth bass was 10.45 and ranged from 0.09 to 3.54 for individual 50-mm size classes (Table 5). Smallmouth bass ranging in size from 201 mm to 350 mm were more fully recruited to electrofishing gear.

Bray Lake

A total of 11 channel catfish (Ictaluras punctatus) were captured in two experimental gill nets set on August 3 and pulled the same day for a total effort of 6 hours. Catfish ranged in length from 187 mm to 315 mm and averaged 260 mm (Figure 6). This was the fewest number of channel catfish sampled by gill nets in Bray Lake since 1984, following restocking in 1983 (Grunder 1986; Olsen and Bell 1987; Grunder et al. 1987). Captured fish were in extremely emaciated condition. Maximum water depth at the time of sampling was about one meter.

Limnological parameters measured on August 3 were: alkalinity = 111 mg/1, hardness - 66 mg/1, specific conductance = 160 mmhos/cm, dissolved oxygen = 8.2 mg/1, surface water temperature = 21°C, and Secchi disc transparency of 0.12 m.

Cow Creek Reservoir

Three experimental gill nets were set in Cow Creek Reservoir on June 4 and left overnight (Figure 7). A total of 527 bridgelip suckers (Catostomus columbianus) were collected from nets on June 5. No other fish species were captured.

Limnological parameters were collected at one location near the dam (Figure 7). Temperature/dissolved oxygen profiles collected on June 4 are found in Figure 8. While temperature did not vary considerably through the water column, dissolved oxygen ranged from 10.2 mg/l at the

Table 2. Comparison of weighted mean back-calculated lengths (mm) at annuli formation for smallmouth bass populations sampled in Idaho waters.

Area	Year sampled	Sample size	Mean length at annulus (mm) 1	2	3	4	5	6	7	8	9
Malad River	1987	44	78	154	205						
Anderson Ranch Reservoir	1987	81	71	132	204	250	282	312			
Snake River - Hells Canyon[a]	1985	157	88	154	218	264	304	348	399	436	467
Brownlee Reservoir[b]	1983	384	72	157	235	299	353	383	421	468	

[a]From Lukens (1986). Used Lee method and regression analysis.
[b]From Rohrer and Chandler (1985).

Table 3. Comparison of mean growth increments (mm) for smallmouth bass populations sampled in Idaho waters.

Area	Year sampled	Sample size	Mean growth increment (mm)								
			1	2	3	4	5	6	7	8	
Malad River	1987	44	78	76	51						
Anderson Ranch Reservoir	1987	81	71	61	72	46	32	30			
Snake River - Hells Canyon[a]	1985	157	88	66	64	46	40	44	51	36	31
Brownlee Reservoir[b]	1983	384	72	85	78	64	54	30	38	47	

[a]From Lukens (1986).
[b]From Rohrer and Chandler (1985).

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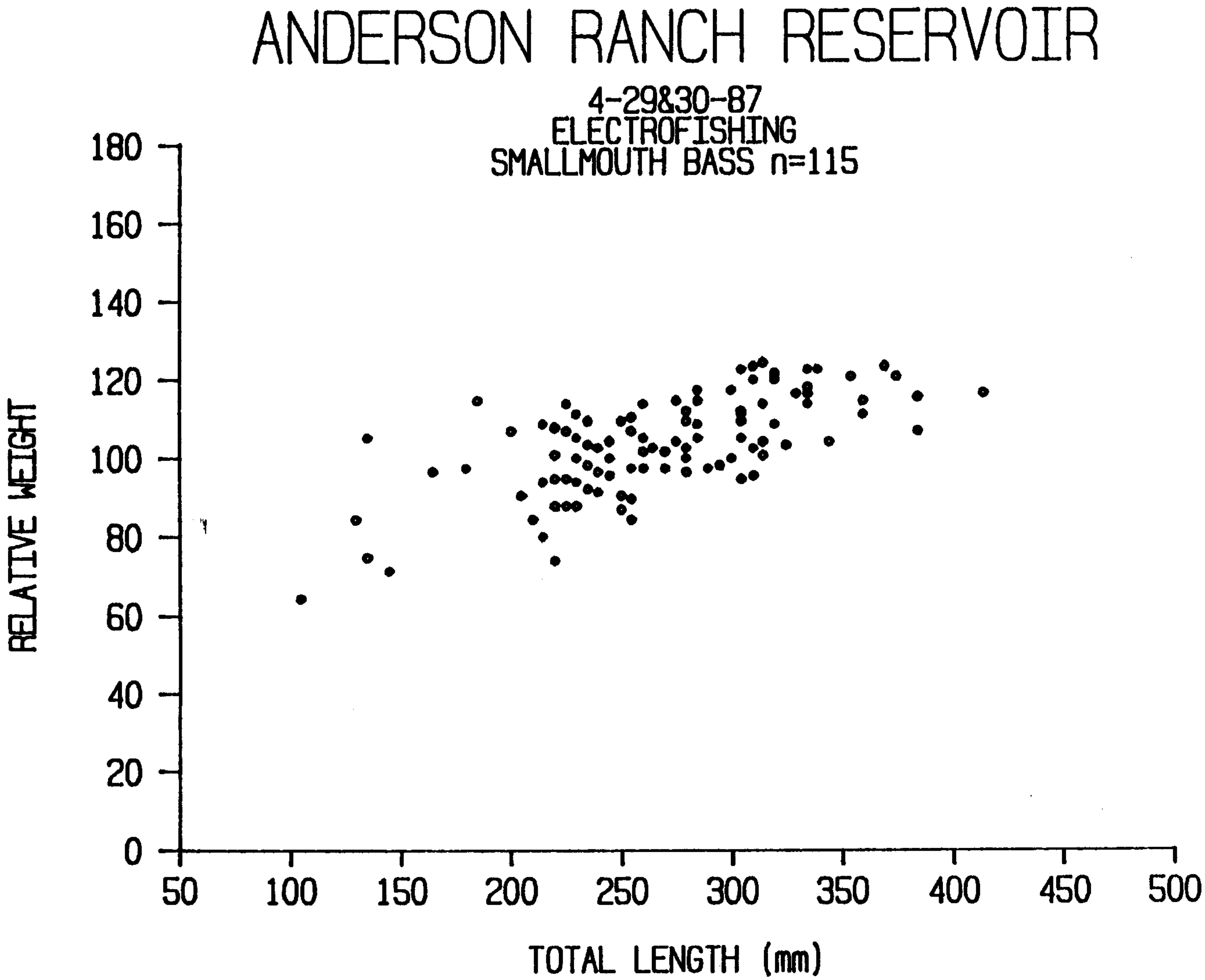

Figure 4. Plot of relative weights (W_r) of individual smallmouth bass sampled by electrofishing Anderson Ranch Reservoir, 1987.

Table 4. Mean relative weights (Wr) per 50-mm length group for smallmouth bass sampled by electrofishing in Anderson Ranch Reservoir, 1987.

Length group (mm)	Number	Mean relative weight (Wr)
101-150	5	80
151-200	.4	104
201-250	39	98
251-300	32	104
301-350	27	113
351-400	7	116
401-450	1	117

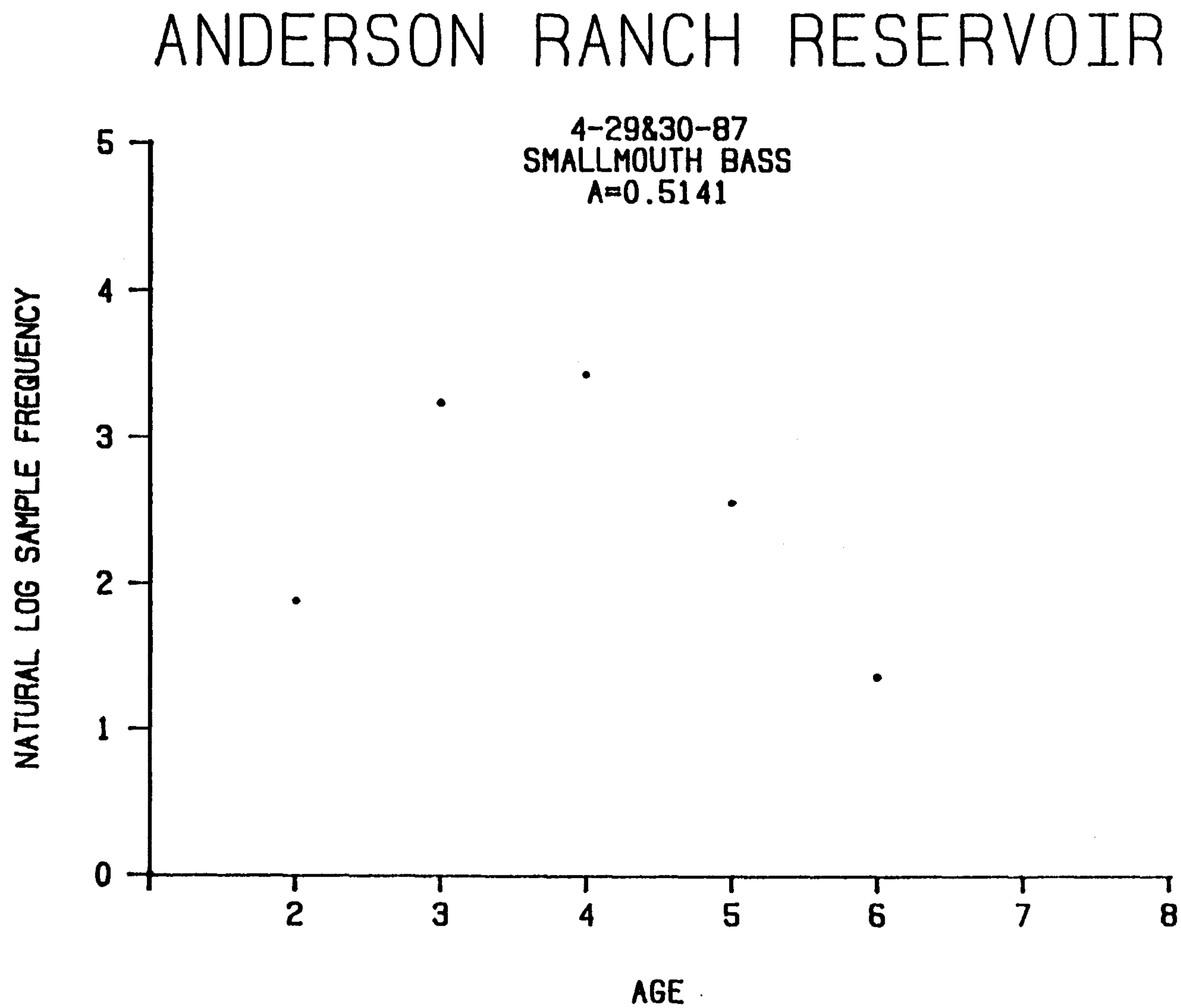

Figure 5. Catch curve generated from electrofishing data for smallmouth bass sampled from Anderson Ranch Reservoir, 1987.

Table 5. Catch per unit effort (fish/h) using electrofishing gear for smallmouth bass per 50 mm length group as sampled from Anderson Ranch Reservoir, 1987.

Length group (mm)	Number	Catch per unit effort (fish/h)
101-150	5	0.45
151-200	4	0.36
201-250	39	3.54
251-300	32	2.90
301-350	27	2.45
351-400	7	0.64
401-450	1	0.09
TOTALS	115	10.45

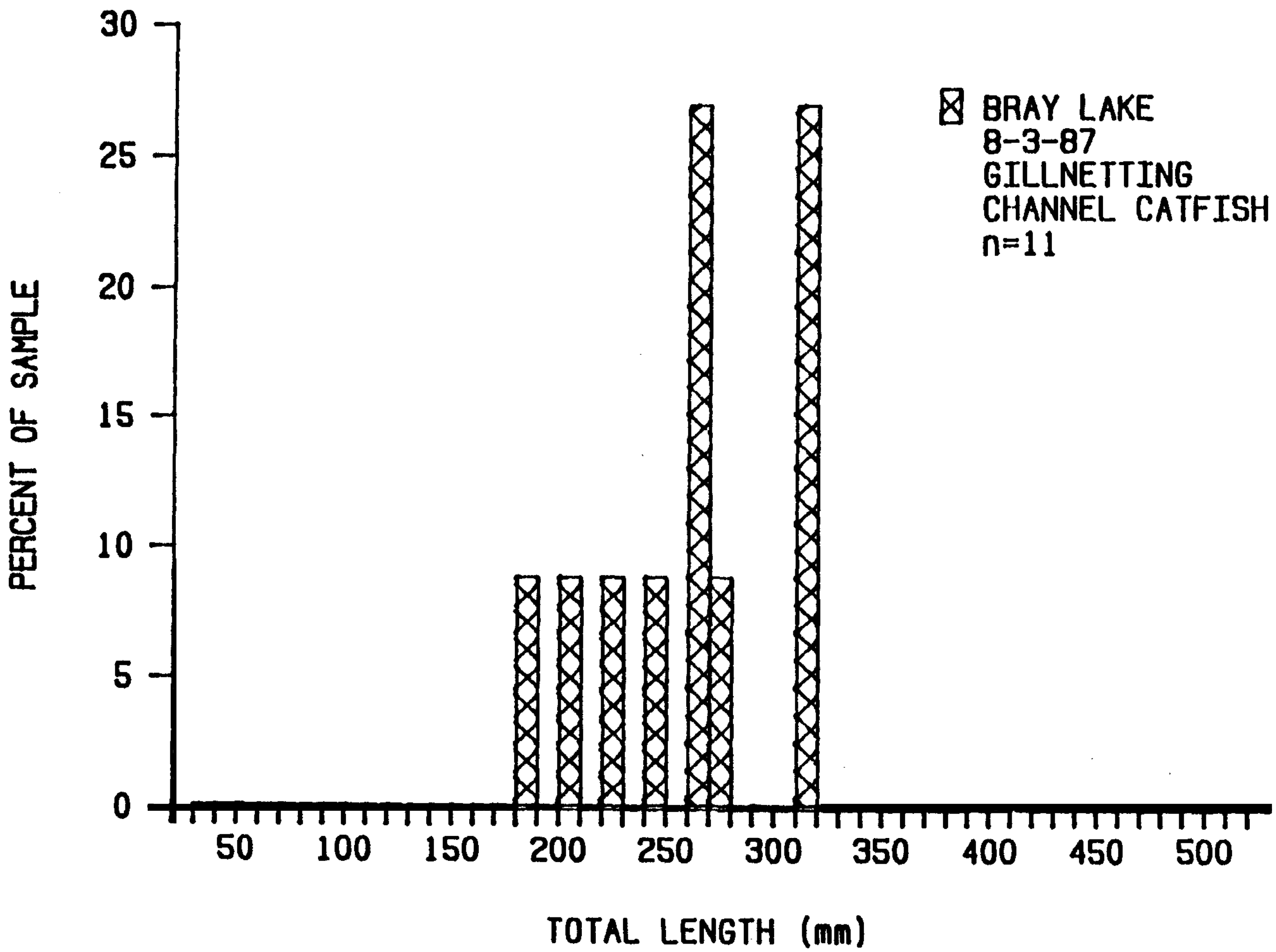

Figure 6. Length frequency diagram of a sample of channel catfish collected with horizontal experimental gill nets in Bray Lake, 1987.

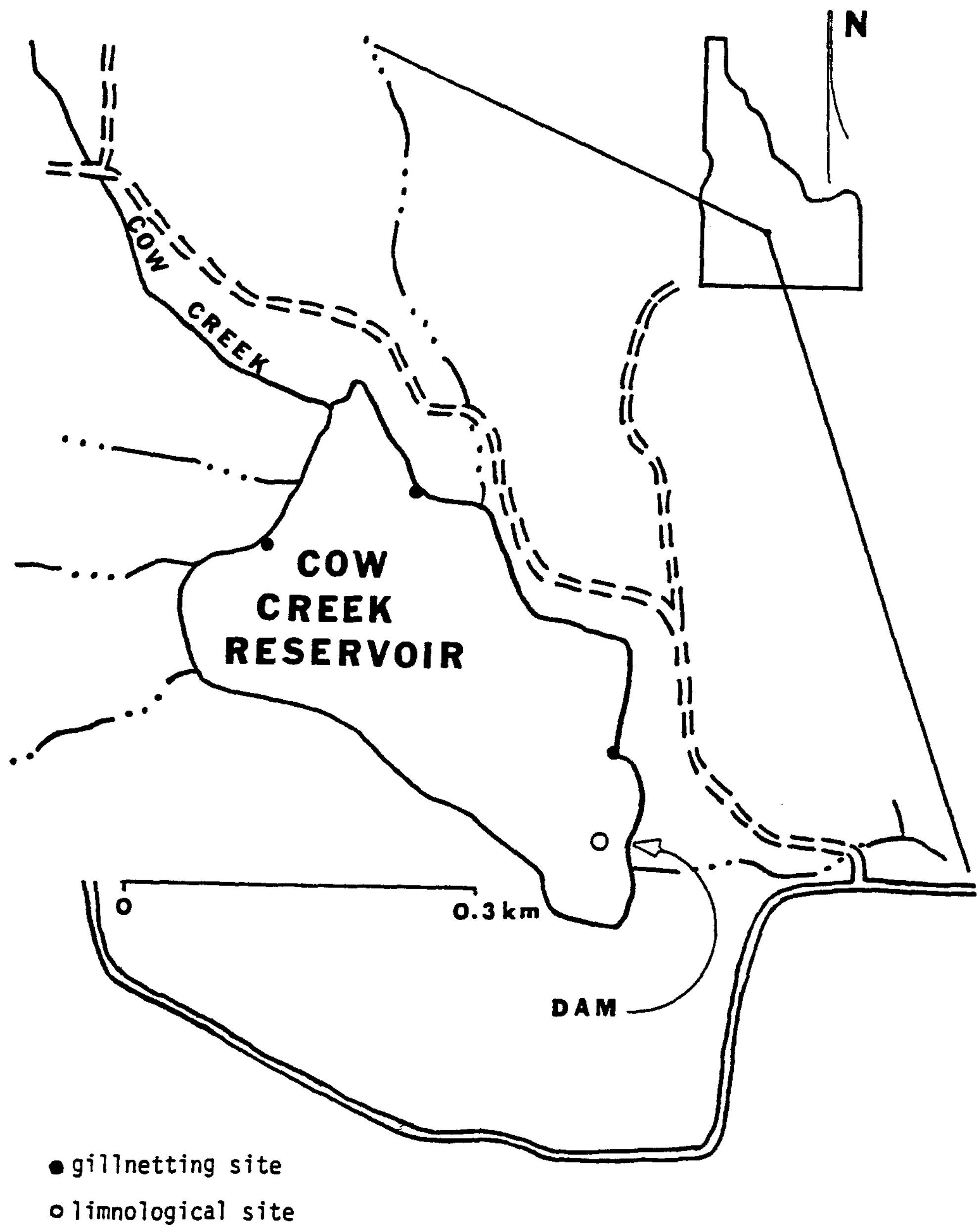

Figure 7. Location map of Cow Creek Reservoir denoting gillnetting and limnological sampling sites, 1987.

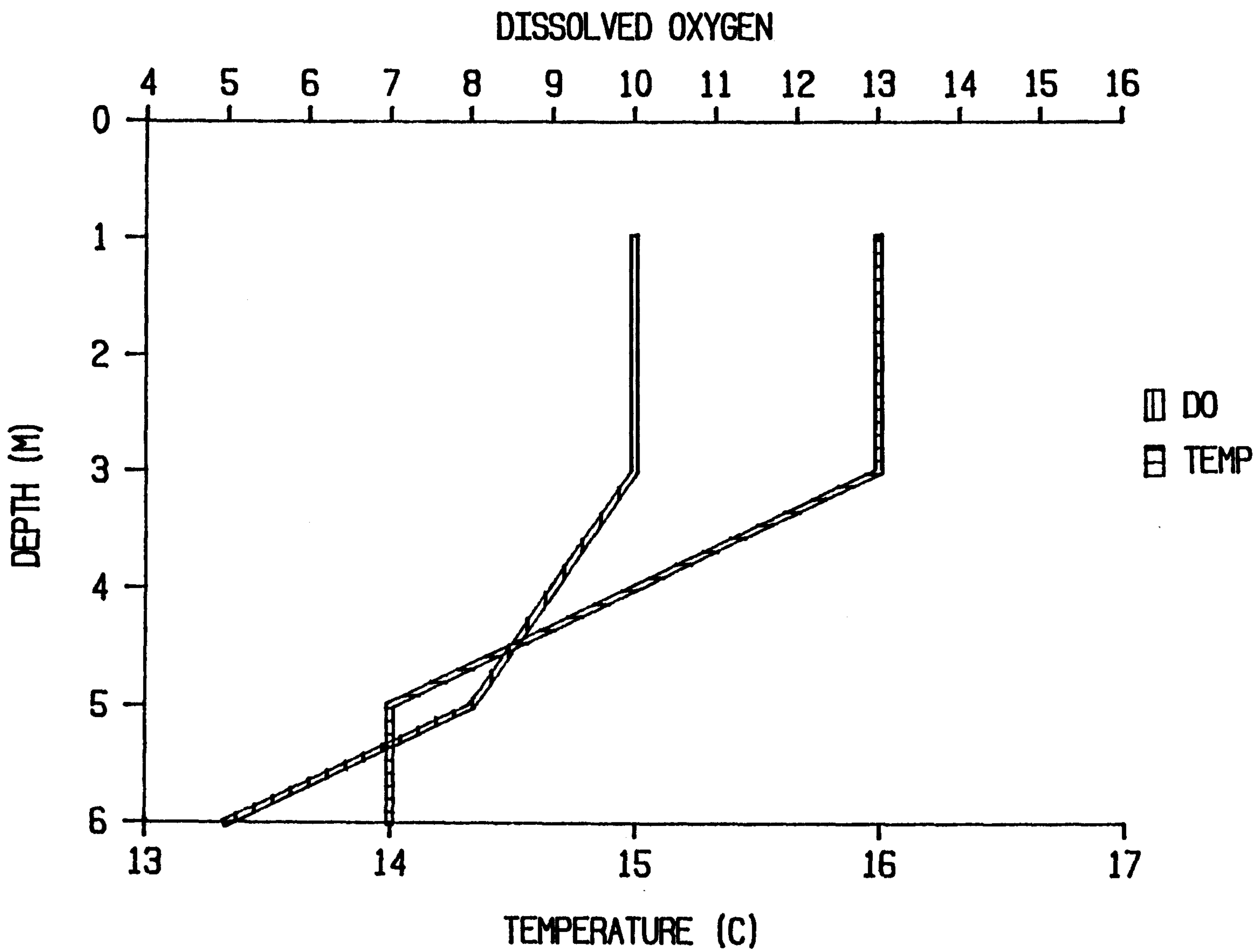

Figure 8. Dissolved oxygen (mg/l) and temperature (^{o}C) profiles collected from Cow Creek Reservoir, June 4, 1987.

surface, down to 4.9 mg/1 at the water-substrate interface. Other limnological measurements taken on June 4 were: alkalinity = 60 mg/1, hardness = 35 mg/1, specific conductance = 120 mmhos/cm, and Secchi disc transparency of 1.8 m.

Species composition of two zooplankton samples collected from Cow Creek Reservoir on June 4 were 64% Cladocera and 36% Copepoda (Figure 9). Organisms per vertical meter sampled averaged 28 cladocerans/m and 49 copepods/m.

Highway 30 Pond

Largemouth bass sampled by electrofishing during the evening of August 13, 1987 averaged 282 mm in length and ranged from 65 mm to 546 mm (Figure 10). The major mode in the length-frequency distribution occurred between 270 mm and 310 mm. Fifty-nine percent of the sample fell within this mode. Bluegill averaged 190 mm in length and ranged from 85 mm to 220 mm (Figure 10). The greatest proportion of the sample fell between 190 mm to 210 mm.

Largemouth bass sampled by electrofishing gear in 1987 were represented by the 1979-1986 year classes (Table 6). Back-calculated annual growth increments averaged 67 mm for largemouth bass sampled from the Highway 30 Pond, which is superior to North Idaho bass populations (Table 7). Largemouth bass from this pond appear to exhibit faster growth rates throughout their lifespan than reported to date for populations elsewhere in Idaho (Tables 7 and 8). Initial age-growth data for Hagerman WMA bass was reported by Grunder (1986). Longevity of south Idaho bass stocks appears substantially less than North Idaho stocks (Table 7).

The PSD index for the mid-August electrofishing sample of largemouth bass was 34%. The RSD-380 index for the same sample was 12%. The PSD index for bluegill was 92%, while the RSD-200 index was 54%.

Relative weights calculated for individual largemouth bass from the electrofishing sample were closely grouped around the optimum Wr of 100 (Figure 11). Mean Wr for bass per 50-mm length group ranged between 92 and 172, with a weighted mean Wr of 108 (Table 9). Relative weights for individual bluegill were typically situated above the optimum W_r of 100 (Figure 12). Mean Wr values for bluegill per 50 mm length group ranged between 120 and 151, with a weighted mean Wr of 122 (Table 10).

Total annual mortality for largemouth bass ages 3 to 8 was 0.67 as estimated from a catch curve (Figure 13).

Electrofishing catch per unit effort (fish/h) for largemouth bass was 196 and ranged from 0 to 124 for 50-mm length group (Table 11). Bass ranging in length from 251 mm to 350 mm were more fully recruited to electrofishing gear.

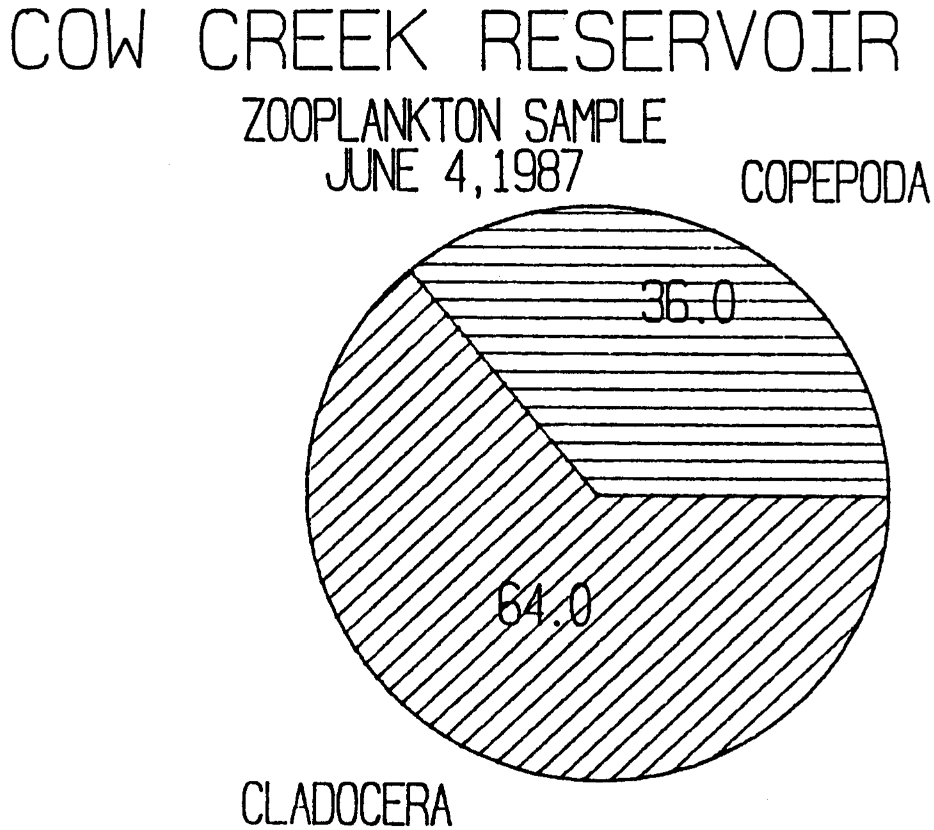

Figure 9. Species composition by order of zooplankton samples collected from Cow Creek Reservoir, June 4, 1987.

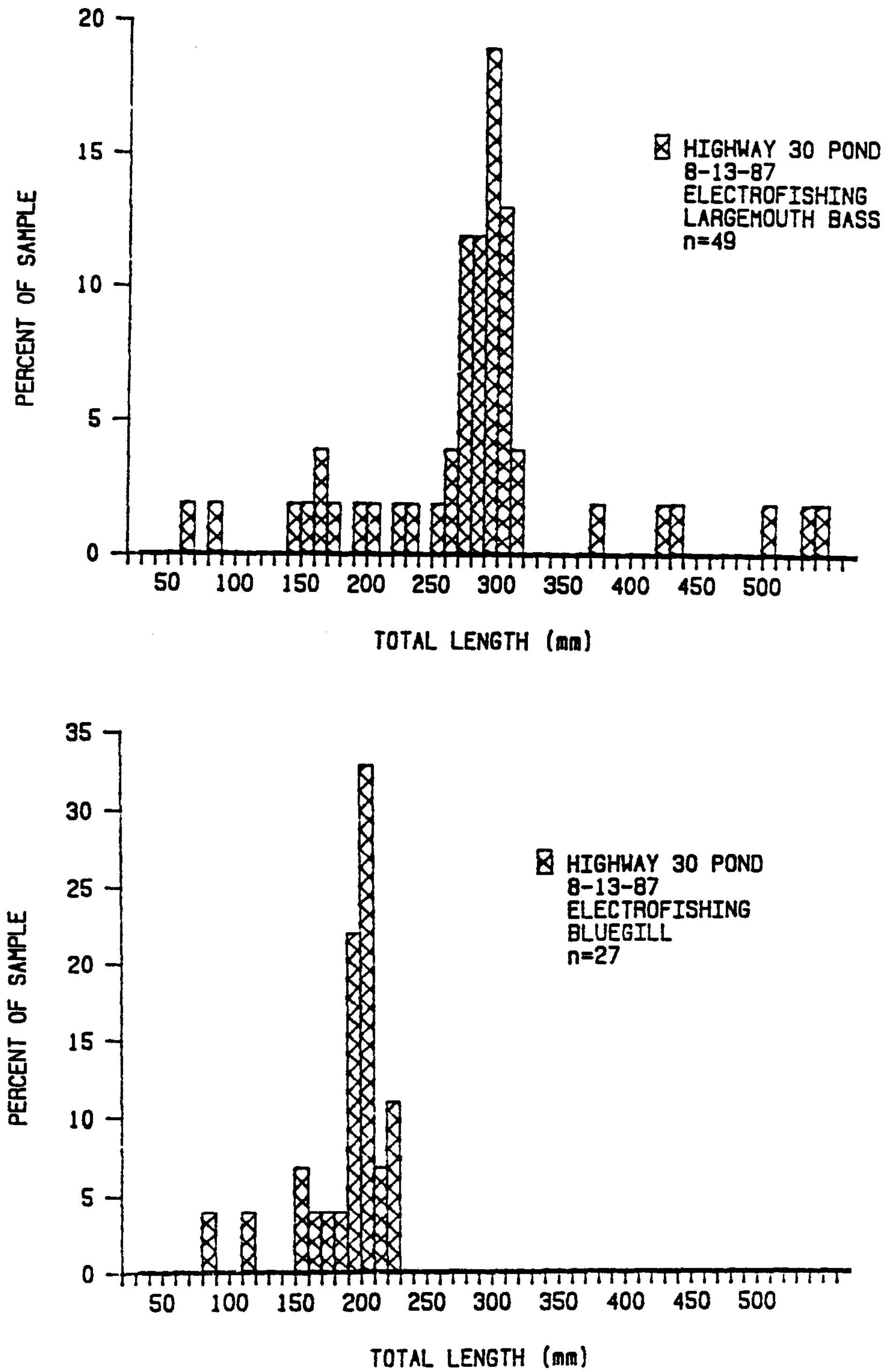

Figure 10. Length frequency diagrams of samples of largemouth bass and bluegill collected by electrofishing the Highway 30 Pond, Hagerman Wildlife Management Area, 1987.

Table 6. Back-calculated lengths at age (mm) for a sample of largemouth bass collected by electrofishing the Highway 30 Pond, Hagerman Wildlife Management Area, 1987. The correction factor (a) used in the analysis was 20 mm. Standard deviations in parentheses.

Age class	Year class	Number of fish	Mean length	Mean length at annulus 1	2	3	4	5	6	7	8
I	1986	6	165	93 (14.7)							
II	1985	6	264	98 (14.5)	184 (32.4)						
III	1984	26	293	92 (17)	186 (31)	260 (22.9)					
IV	1983	1	301	84 (0)	149 (0)	216 (0)	28 (0)				
V	1982	1	439	130 (0)	301 (0)	352 (0)	40 (0)	42 (0)			
VI	1981	1	424	100 (0)	240 (0)	341 (0)	37 (0)	40 (0)	41 (0)		
VII	1980	1	538	126 (0)	267 (0)	388 (0)	43 (0)	47 (0)	50 (0)	52 (0)	
VIII	1979	1	546	128 (0)	298 (0)	402 (0)	43 (0)	46 (0)	49 (0)	51 (0)	534 (0)
Number of fish		43		43	37	31	5	4	3	2	1
Weighted mean length				95	194	272	38 5	44 2	47 1	52 2	534
Increment of growth				95	99	78	11 [illegible]	57	29	51	12

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Table 7. Comparison of mean growth increments (mm) for largemouth bass populations sampled in Idaho waters.

Area	Year sampled	Sample size	Mean growth increment (mm)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
Hagerman WMA	1987	43	95	99	78	113	57	29	51	12						
Lower Salmon Falls Reservoir	1987	61	90	83	95	78										
Mud Lake[a]	1983	11	63	41	65	60	49	30	28	28	30	35				
Fernan Lake[b]	1981-1982	366	63	38	81	48	46	65	33	30	28	28	36	23	12	14
Thompson Lake[b]	1981-1982	485	69	70	73	65	48	47	36	32	26	16	27	16	5	10
Medicine Lake[b]	1981	188	71	77	72	70	87	40	40	7	32	33	11			
Blue Lake[b]	1982	56	72	78	81	73	59	48	30	28	22	32	12	--	10	
Swan Lake[b]	1982	74	70	89	89	70	55	51	42	--	9	--	9	18	17	14
Round Lake[c]	1983	110	61	62	66	67	51	47	33	16	20	24	19	--	5	
Perkins Lake[c]	1983	156	65	89	57	54	43	43	40	43	4	--	4	--		
Robinson Lake[c]	1983	232	56	72	65	54	40	36	54	49	23	17	20	20	6	

[a]From Corsi et al. (1986).
[b]From Rieman (1983).
[c]From Rieman (1984).

Table 8. Comparison of weighted mean back-calculated lengths (mm) at annuli formation for largemouth bass populations sampled in Idaho waters.

Area	Year sampled	Sample size	Mean length at annulus (mm) 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Hagerman WMA	1987	43	95	194	272	385	442	471	522	534						
Lower Salmon Falls Reservoir	1987	61	90	173	268	346										
Mud Lake[a]	1983	11	63	104	169	229	260	290	m318	346	376	411				
Fernan Lake[b]	1981-1982	366	63	101	182	230	276	341	374	404	432	460	496	519	531	545
Thompson Lake[b]	1981-1982	485	69	139	212	277	325	372	408	440	466	482	509	525	530	540
Medicine Lake[b]	1981	188	71	148	220	290	377	417	457	464	496	529	540			
Blue Lake[b]	1982	56	72	150	231	304	363	411	441	469	491	523	535	530		540
Swan Lake[b]	1982	74	70	159	248	318	373	424	466	458	467	462	471	489	506	520
Round Lake[c]	1983	110	61	123	189	256	307	354	387	403	423	447	466	462		467
Perkins Lake[c]	1983	156	65	154	211	265	308	351	391	434	438	435	439	430		
Robinson Lake[c]	1983	232	56	128	193	247	287	323	377	426	449	466	486	506	512	

[a]From Corsi et al. (1986). Used Fraser-Lee method with standard intercept value of 20 mm.
[b]From Rieman (1983). Used standard proportion method and regression analyses.
[c]From Rieman (1984). Used standard proportion method and regression analyses.

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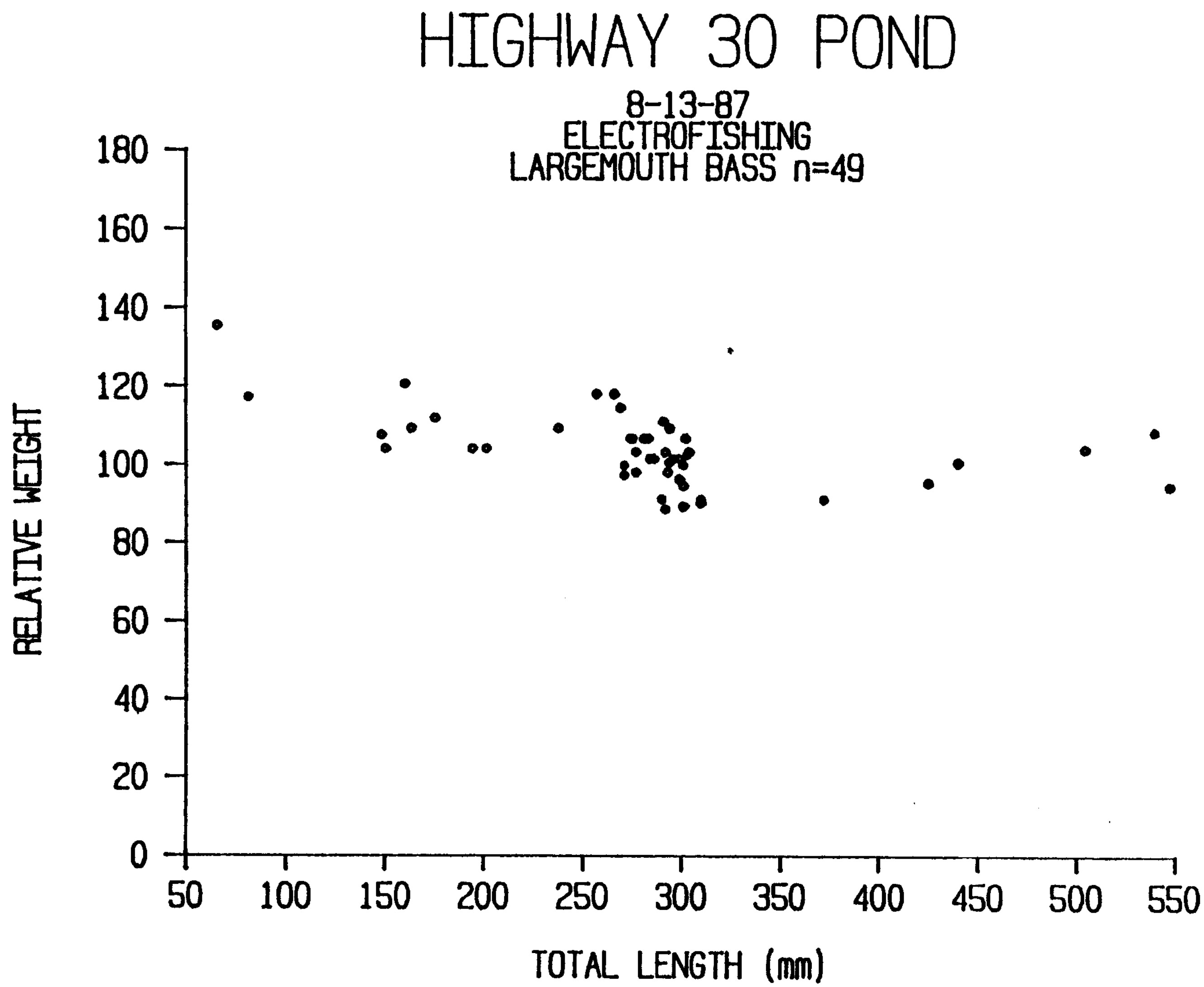

Figure 11. Plot of relative weights (W_r) for individual largemouth bass sampled with electrofishing gear from the Highway 30 Pond, Hagerman Wildlife Management Area, 1987.

Table 9. Mean relative weights (Wr) per 50-mm length group for largemouth bass sampled by electrofishing in the Highway 30 Pond, Hagerman WMA, 1987.

Length group (mm)	Number	Mean relative weight (W_r)
51-100	2	127
101-150	3	108
151-200	3	113
201-250	3	172
251-300	26	103
301-350	6	98
351-400	1	92
401-450	2	98
451-500	0	--
501-550	3	103

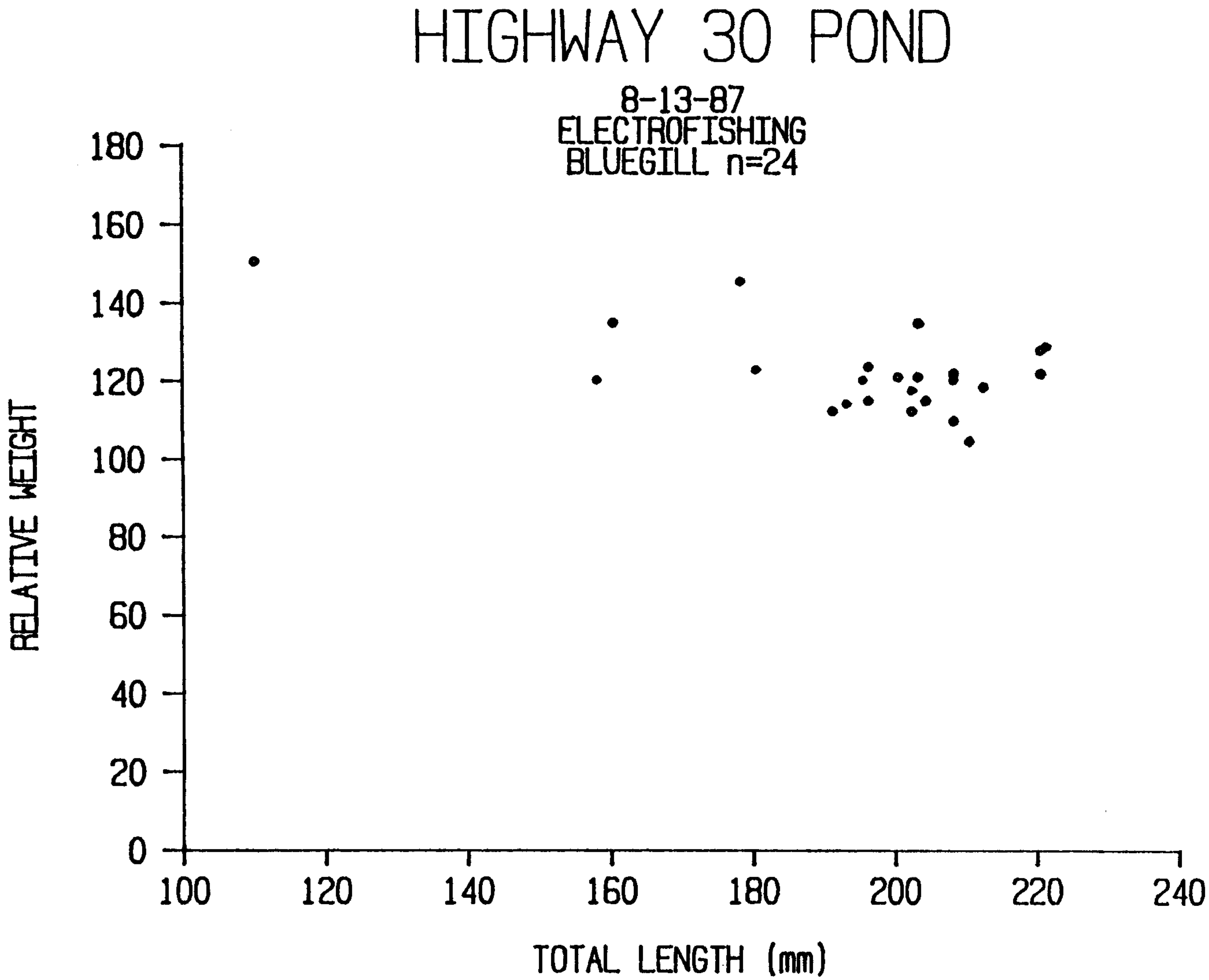

Figure 12. Plot of relative weights (W_r) for individual bluegill sampled with electrofishing gear from the Highway 30 Pond, Hagerman Wildlife Management Area, 1987.

Table 10. Mean relative weights (W_r) per 50-mm length group for bluegill sampled by electrofishing gear in the Highway 30 Pond, Hagerman WMA, 1987.

Length group (mm)	Number	Mean relative weight (Wr)
101-150	1	151
151-200	11	123
201-250	13	120

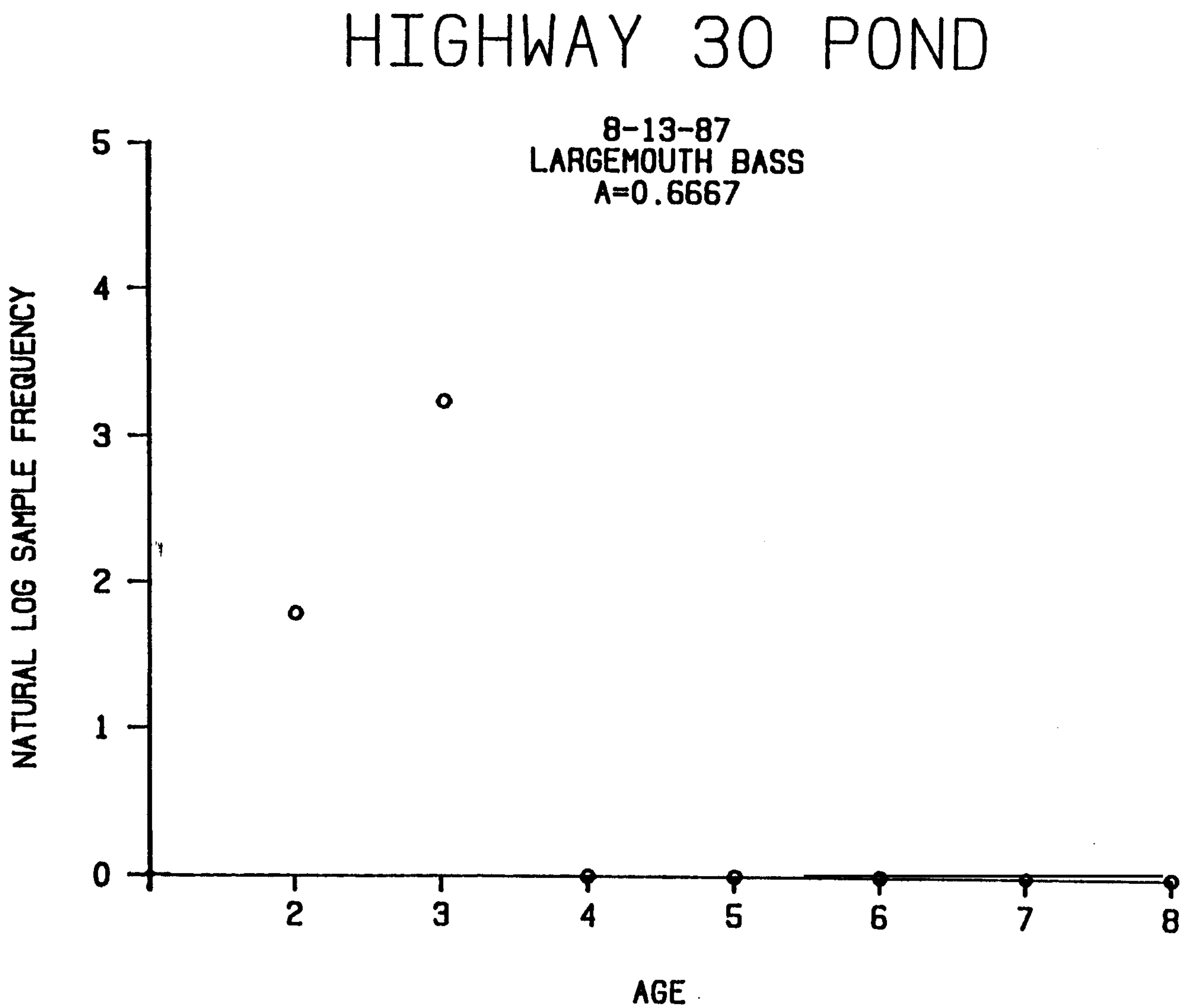

Figure 13. Catch curve generated from electrofishing data for largemouth bass sampled in the Highway 30 Pond, Hagerman Wildlife Management Area, 1987.

Table 11. Catch per unit effort (fish/h) using electrofishing gear for largemouth bass and bluegill per 50-mm length group as sampled from the Highway 30 Pond, Hagerman WMA, 1987.

Length group (mm)	Number		Catch per unit effort (fish/h)	
	Bass	Bluegill	Bass	Bluegill
50-100	2	1	8	4
101-150	3	1	12	4
151-200	3	12	12	48
201-250	3	14	12	56
251-300	26	0	104	0
301-350	6	0	24	0
351-400	1	0	4	0
401-450	2	0	8	0
451-500	0	0	0	0
501-550	3	0	12	0
TOTALS	49	28	196	112

Lake Walcott

Gill nets were set at three general locations in Lake Walcott during 1987 (Figure 14). Results suggest a paucity of game fish species (Table 12). The most prevalent species captured in gill nets were Utah chubs (Gila atraria) and sucker species (Catostomus sp.). Yellow perch were the only game fish collected, comprising only 141 of the gill net sample. Carp (Cyprinus carpio) comprised an insignificant proportion of all samples. The average number of fish captured per net was 43.2 (Table 12).

Beach seining was performed at three general locations (Figure 14) with all individual fish collected being young-of-the-year. Four fish species were collected while beach seining Lake Walcott (Table 13). Yellow perch were the most abundant species comprising 65% of the overall total, followed by redside shiners (Richardsonius balteatus), sucker species, and carp. Nearly 99% of the total sample was collected on July 30 from the lower reservoir site.

Basic limnological data was collected at four locations in Lake Walcott (Figure 14) and is summarized in Table 14. During May and July, alkalinity averaged 165 mg/l, hardness 198 mg/l, and conductivity 408 mmhos/cm. During May, July, and August, Secchi transparency averaged 1.6 m. No significant variation occurred in either dissolved oxygen or temperature throughout the water column on May 8 near the dam (Figure 15a), while slight variation throughout the water column was measured on July 30 at both the dam and Smith Springs (Figures 15b and 15d). On July 30, dissolved oxygen levels measured near Bird Island were below 5 mg/l in the lower 3 m of the water column (Figure 15c).

Zooplankton samples collected in May, July, and August revealed relatively low numbers of organisms present. In May samples taken near the dam, species composition was 57% Copepods and 43% Cladocera (Figure 16). Average number of organisms sampled per vertical meter was 72 copepods and 53 cladocerans. August samples collected near Gifford Springs contained inconsequential numbers of zooplankton.

Lower Salmon Falls Reservoir

Gill nets were set at three locations in the upper end of Lower Salmon Falls Reservoir in early June (Figure 17). A total of ten fish species were collected in three gill nets (Table 15). Collectively, 321 fish were caught, with Utah chubs comprising nearly half the total. Game fish species comprised approximately 30% (Table 15). Largemouth bass were common in the Buckeye Cove samples, ranging from 124 mm to 498 mm in length and averaging 216 mm (Figure 18). Mean W_r values per 50 mm length group ranged from 121 to 139, with a weighted mean W_r of 125 (Table 16).

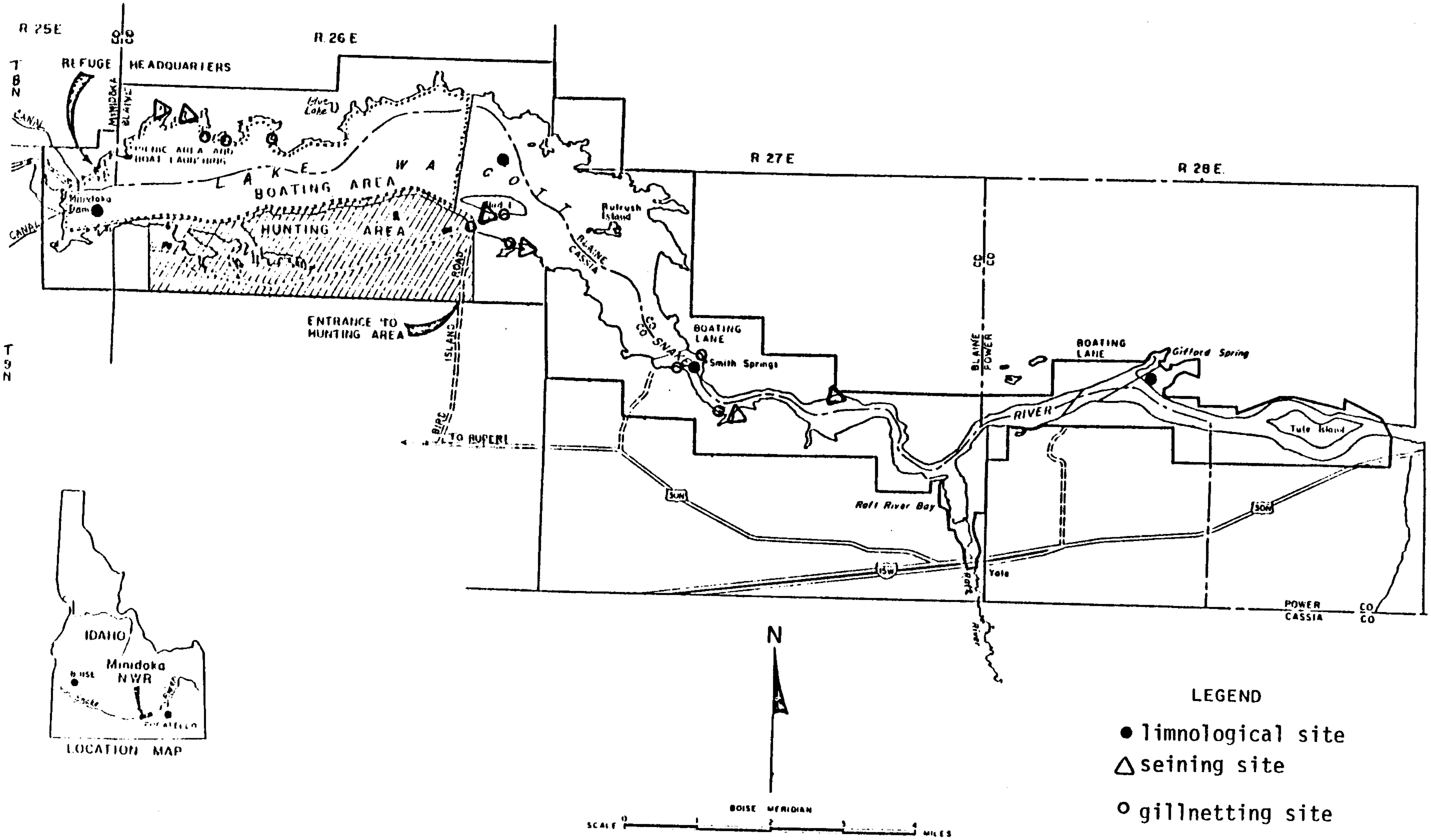

Figure 14. Location of Lake Walcott denoting gillnetting, seining, and limnological sampling sites, 1987.

Table 12. Results of gillnetting in selected areas of Lake Walcott, 1987. Percentages are in parentheses.

Date	Location	Number of nets	Number per species YP	UTC	SCK	CRP	Totals	Number fish per net
7/30-7/31 1987	R.26E,T.8S,S.32&33 (lower reservoir; north shore)	3	1 (<1)	119 (77)	33 (21)	1 (<1)	154	51.3
8/17-8/18 1987	R.26E,T.9S,S.1,2,&12 (mid-reservoir; south shore)	3	33 (34)	50 (51)	14 (14)	1 (1)	98	32.6
8/18-8/19 1987	R.27E,T.9S,S.16 (upper reservoir; north shore)	1	3 (6)	38 (78)	6 (12)	2 (4)	49	49.0
8/18-8/19 1987	R.27E,T.9S,S.17&21 (upper reservoir; south shore)	2	15 (17)	53 (60)	15 (17)	5 (6)	88	44.0
	TOTALS	9	52 (14)	260 (67)	68 (17)	9 (2)	389	43.2

YP = yellow perch, UTC Utah chub, SCK = sucker species, and CRP = carp.

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Table 13. Results of beach seining in selected shoreline areas of Lake Walcott, 1987. Percentages are in parentheses.

Date	Location	Number of hauls	Number per species YP	RSS	SCK	CRP	Totals
7/30/87	R.26E,T.8S,S.31 (lower reservoir; north shore)	2	1,675 (66)	511 (20)	360 (14)	0 (0)	2,546
7/30/87	R.27E,T.9S,S.5 (mid-reservoir; north shore)	3	1 (8)	11 (84)	1 (8)	0 (0)	13
8/17/87	R.26E,T.9S,S.1 (mid-reservoir; south shore)	2	0 (0)	0 (0)	0 (0)	1 (100)	1
8/17/87	R.26E,T.9S,S.12 (mid-reservoir; south shore)	2	0 (0)	1 (25)	3 (75)	0 (0)	4
8/18/87	R.27E,T.9S,S.23 (upper reservoir; north shore)	2	0 (0)	5 (38)	7 (54)	1 (8)	13
8/18/87	R.27E,T.9S,S.21 (upper reservoir; south shore)	2	0 (0)	1 (50)	0 (0)	1 (50)	2
	TOTALS	13	1,676 (65)	529 (21)	371 (14)	3 (<0.01)	2,579

YP = yellow perch, RSS = redside shiner, SCK = sucker species, and CRP = carp.

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Table 14. Mean water quality measurements from four sampling stations in Lake Walcott, during May, July, and August, 1987.

Parameter	May 8	Date July 30	August 18
Alkalinity (mg/1)	153	177	--
Hardness (mg/1)	186	210	--
Conductivity (mmhos/cm)	425	390	--
Secchi transparency (m)	2.7	1.2	0.75
Temperature[a] (°C)	16.5	22	--
Dissolved oxygen[a] (mg/1)	7.9	8.1	--

[a]Mean value at one meter deep.

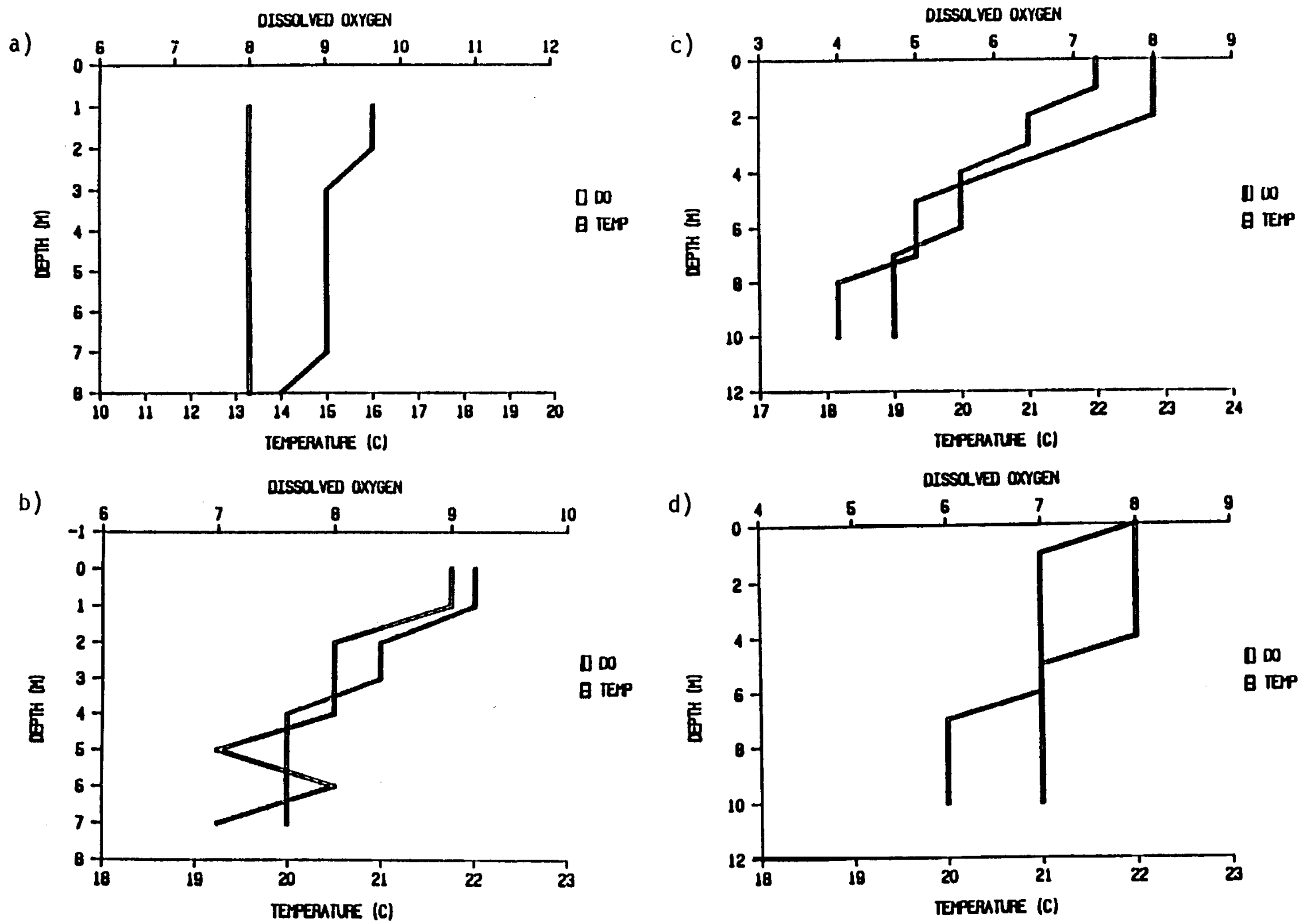


Figure 15. Dissolved oxygen (mg/l) and temperature (^{o}C) profiles from four stations in Lake Walcott, 1987 (a=sample taken on May 8 near Minidoka Dam, b=sample taken on July 30 near Minidoka Dam, c=sample taken immediately north of Bird Island on July 30, and d=sample taken near Smith Springs on July 30).

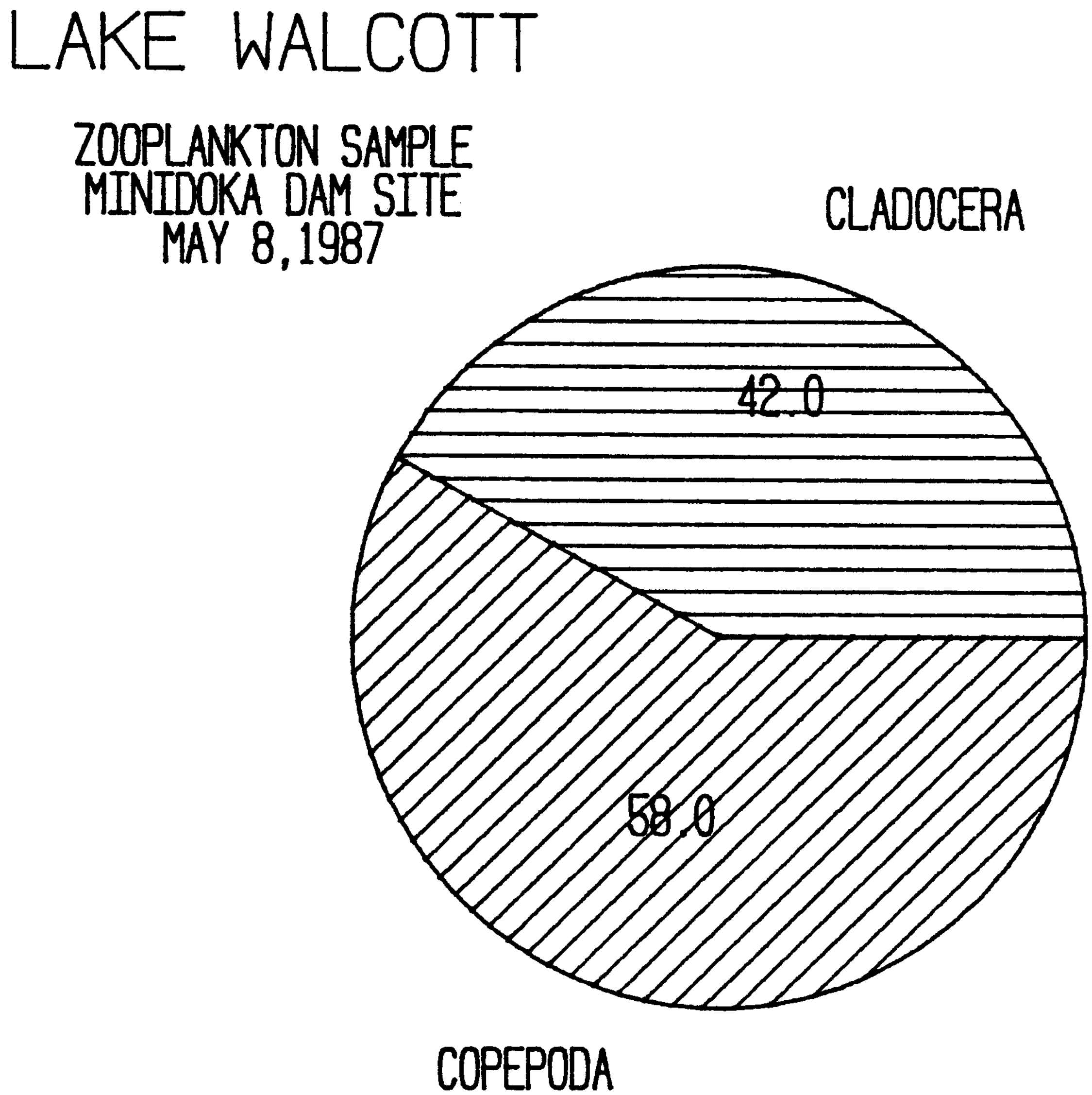


Figure 16. Species composition by order of zooplankton samples collected from Lake Walcott, May 8, 1987.

●limnological site
○gillnetting site

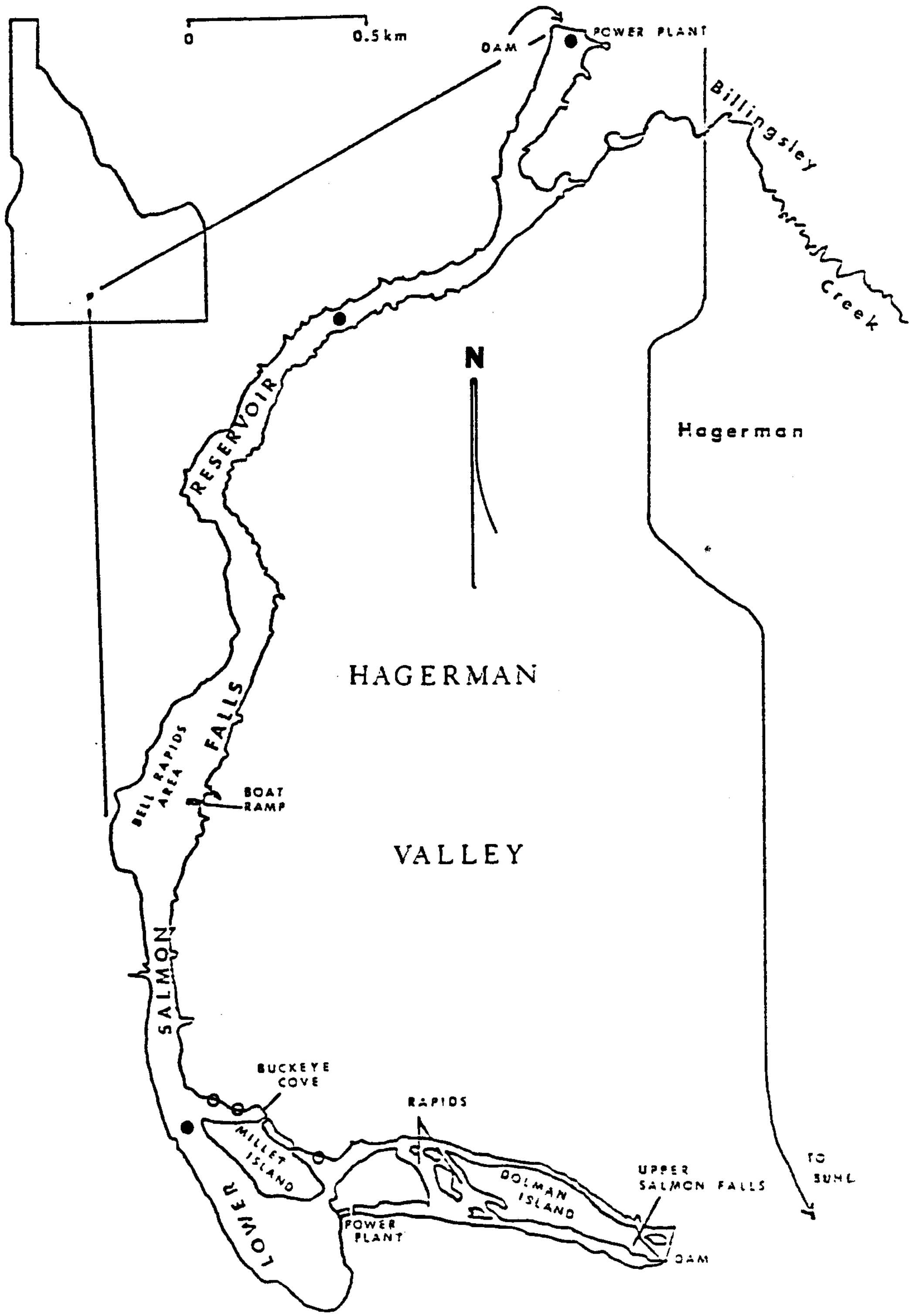


Figure 17. Location map of Lower Salmon Falls Reservoir denoting gillnetting and limnological sampling sites, 1987.

Table 15. Results of gillnetting in selected areas of Lower Salmon Falls Reservoir, 1987. Percentages are in parentheses.

Date	Location	Number of nets	LMB	HRB	BT	BG	YP	NSQ	UTC	SCK	CRP	BBH	Totals	Number fish per net
6/8-6/9 1987	Bay immediately upriver from Buckeye Cove	1	1 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10 (45)	1 (5)	10 (45)	0 (0)	22	22
6/8-6/9 1987	Buckeye Cove	2	50 (17)	2 (<1)	1 (<1)	3 (1)	39 (13)	27 (9)	137 (46)	16 (5)	23 (8)	1 (<1)	299	149.5
	TOTALS	3	51 (16)	2 (<1)	1 (<1)	3 (<1)	39 (12)	27 (8)	147 (46)	17 (5)	33 (10)	1 (<1)	321	107

LMB = largemouth bass, HRB = hatchery rainbow trout, BT = brown trout, BG = bluegill, YP = yellow perch, NSQ = northern squawfish, UTC = Utah chub, SCK = sucker species, CRP = carp, and BBH = brown bullhead.

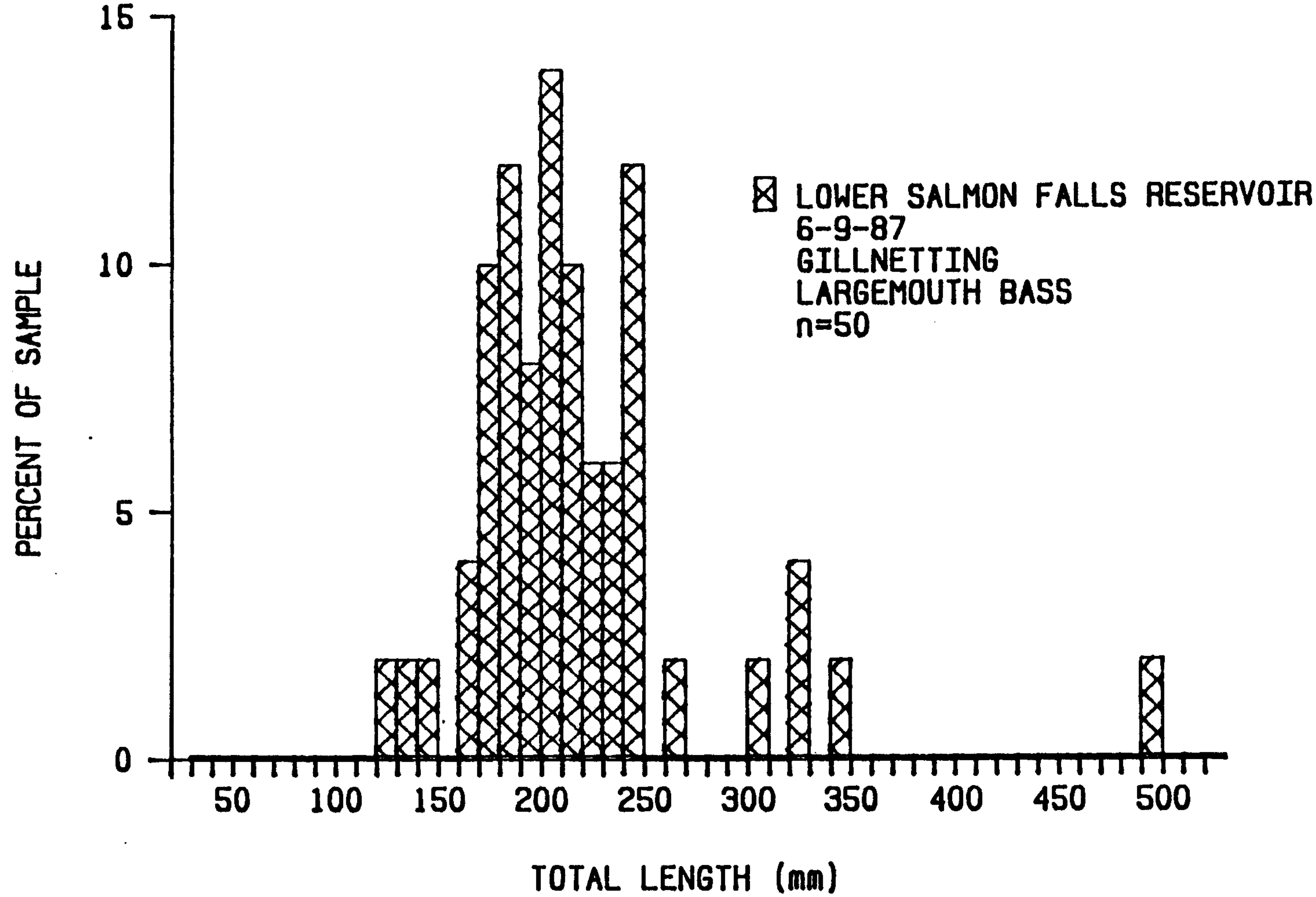


Figure 18. Length frequency diagram of a sample of largemouth bass collected with horizontal experimental gill nets in Lower Salmon Falls Reservoir, 1987.

Table 16. Mean relative weight (W_r) per 50-mm length group for largemouth bass sampled by gillnetting in Lower Salmon Falls Reservoir, July 9, 1987.

Length group (mm)	Number	Relative weight
101-150	3	122
151-200	17	121
201-250	23	128
251-300	1	139
301-350	3	126

A total of 70 largemouth bass and 102 bluegill were collected by electrofishing Buckeye Cove during August 4-5. Bass averaged 196 mm in length and ranged from 42 mm to 415 mm (Figure 19). Bluegill averaged 98 mm in length and ranged from 48 mm to 164 mm (Figure 19).

Largemouth bass sampled by electrofishing were represented by year classes 1983-1986 (Table 17). Back-calculated annual growth increments averaged 86 mm, which is superior to other reported Idaho bass populations. However, in this instance, only four age groups were represented (Table 17). Largemouth bass from this impoundment exhibit growth rates slightly less than reported for Hagerman WMA waters (Tables 7 and 8).

The PSD index calculated for largemouth bass from the early August electrofishing sample was 41X. The RSD-380 index from the same sample was 3%. The PSD index for bluegill was 6%. No bluegill over 200 mm in length were collected.

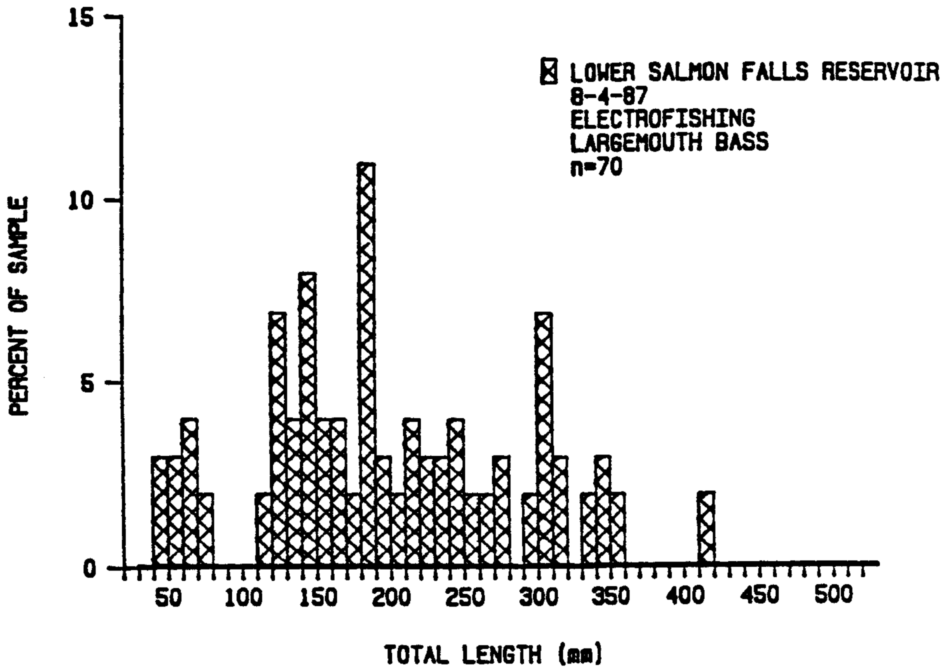
Relative weights calculated for individual largemouth bass from the electrofishing sample appear widely scattered around the optimum W_r of 100 (Figure 20). Mean Wr for bass per 50 mm length group ranged between 108 and 146, with a weighted mean Wr of 116 (Table 18). Relative weights for individual bluegill were generally well above the optimum W_r (Figure 21). Mean W_r values for bluegill per 50 mm length group ranged between 118 and 135, with a weighted mean W_r of 129 (Table 19).

Total annual mortality for largemouth bass ages 2 to 4 was 0.65 as estimated from a catch curve (Figure 22).

Electrofishing catch per unit effort for largemouth bass was 70 fish/h and ranged from 1 to 20 fish/h for 50 mm length groups (Table 20). Bass between 101 mm and 250 mm appeared to be more fully recruited by electrofishing gear. Catch per unit effort for bluegill ranged from 0 to 62 fish/h for 50 mm length groups, with a total of 102 (Table 20).

Water quality sampling was conducted in June and August at three locations in Lower Salmon Falls Reservoir (Figure 17). On June 8, Secchi transparency averaged 0.75 m and conductivity 500 mmhos/cm. On August 4, Secchi transparency averaged 1.9 m. Dissolved oxygen and temperature profiles taken on August 4 were fairly uniform throughout the water column at all three locations (Figure 23).

Zooplankton samples collected at three locations in June and August contained very low numbers of organisms. In June, the average number of organisms sampled per vertical meter were 0.5 at the upper site, 8.8 at the middle site, and 6.0 at the lower site. These samples were comprised of 97% Cladocera and 3% Diptera. In August, no zooplankton were found in samples collected.



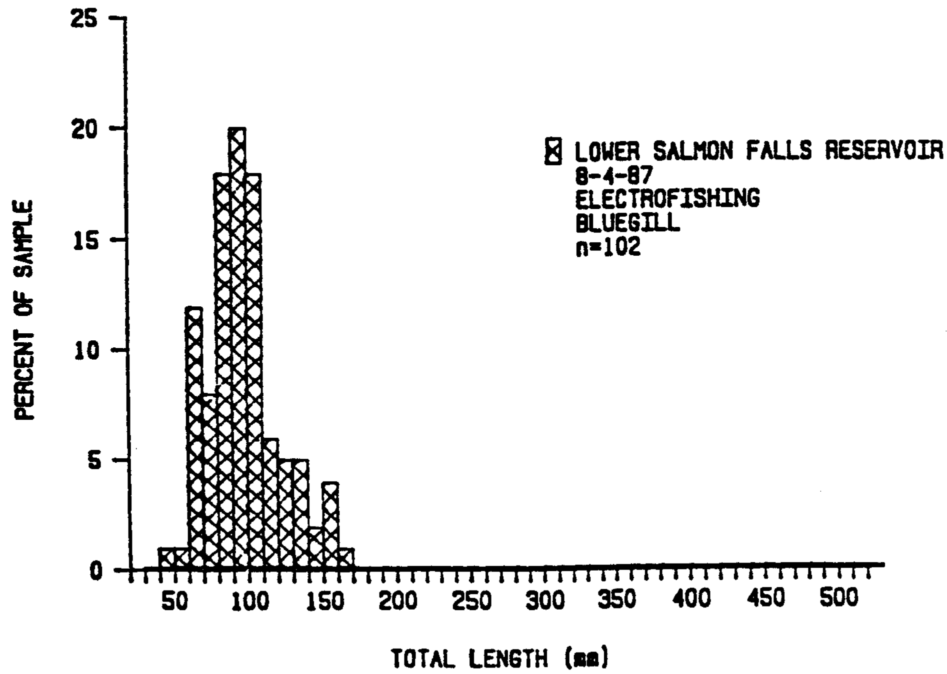


Figure 19. Length frequency diagrams of samples of largemouth bass and bluegill collected by electrofishing Lower Salmon Falls Reservoir, 1987.

Table 17. Back-calculated lengths at age (mm) for a sample of largemouth bass collected by electrofishing Lower Salmon Falls Reservoir, 1987. The correction factor (a) used in the analysis was 20 mm. Standard deviations in parentheses.

Age class	Year class	Number of fish	Mean length	Mean length at annulus (mm) 1	2	3	4
I	1986	29	156	86(18.8)			
II	1985	17	226	82(9.6)	162(35.3)		
III	1984	13	306	102(11.4)	182(40.2)	263(46)	
IV	1983	2	364	126(2.1)	205(66.4)	298(57.1)	346(73.2)
Number of fish		61		61	32	15	2
Weighted mean length				90	173	**268**	346
Increment of growth				90	83	95	78

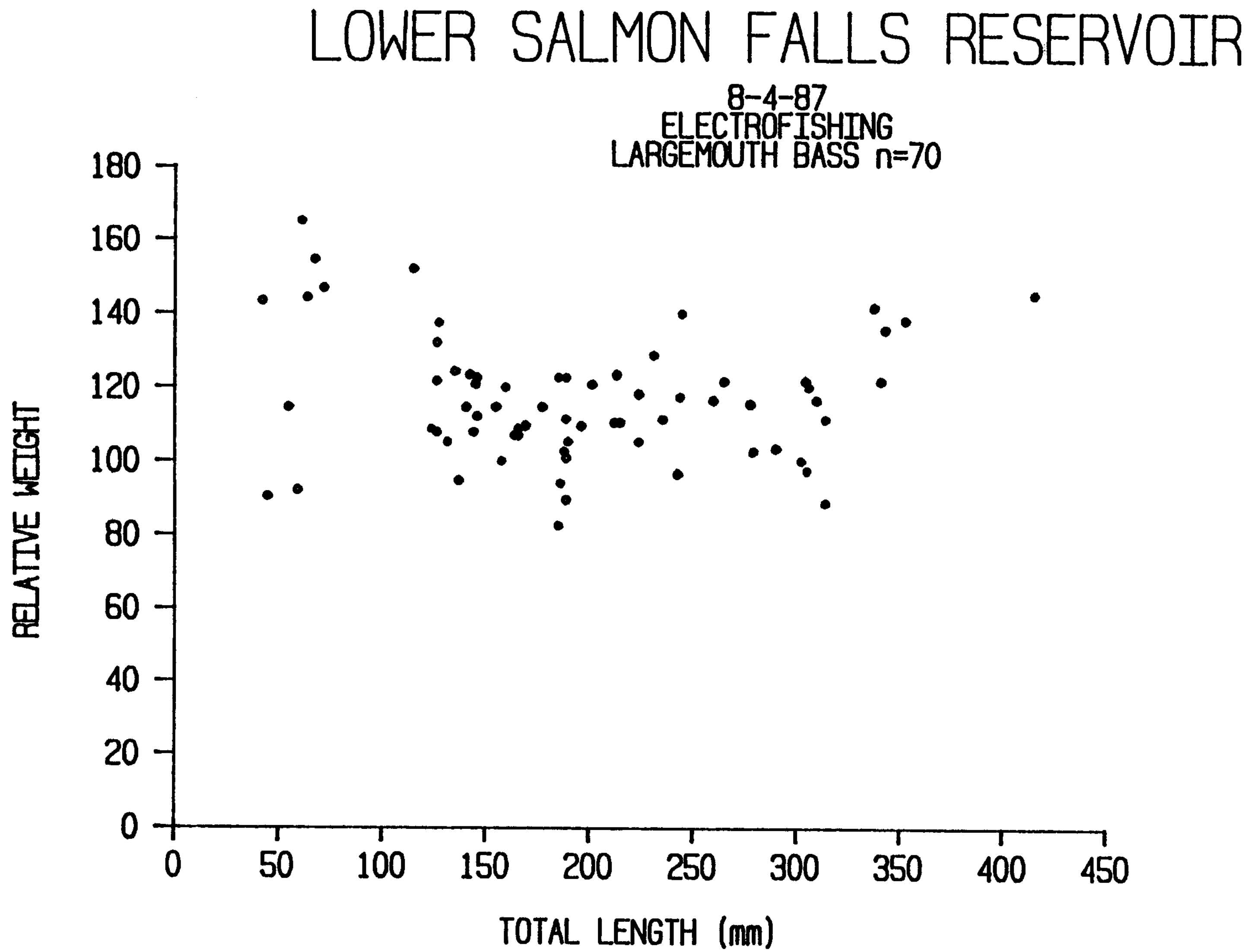


Figure 20. Plot of relative weights (W_r) for individual largemouth bass sampled by electrofishing Lower Salmon Falls Reservoir, 1987.

Table 18. Mean relative weight (W_r) per 50-mm length group for largemouth bass sampled by electrofishing in Lower Salmon Falls Reservoir, August 4, 1987.

Length group (mm)	Number	Relative weight (Wr)
0-50	2	118
51-100	6	137
101-150	13	120
151-200	20	108
201-250	12	115
251-300	6	114
301-350	9	115
351-400	1	139
401-450	1	146

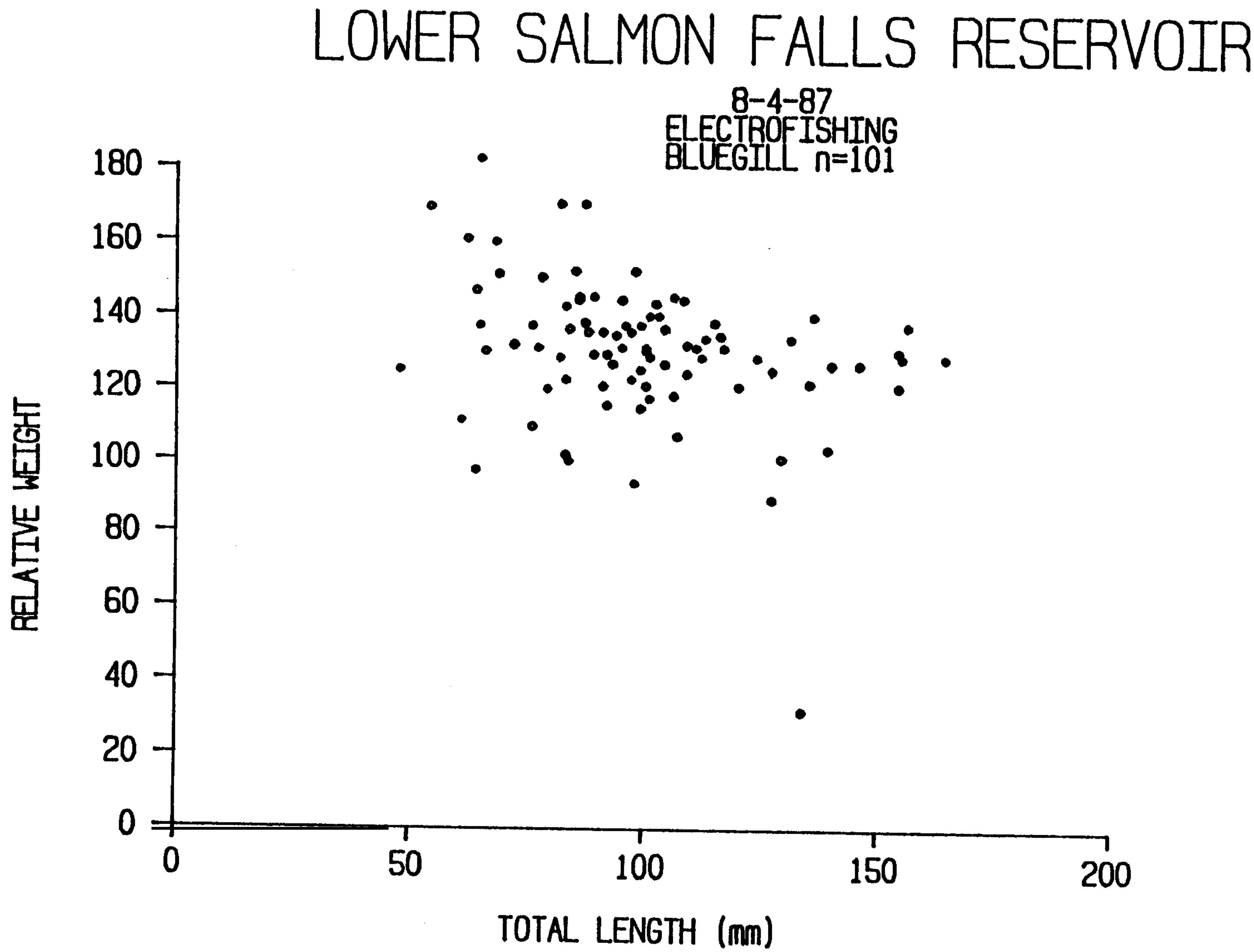


Figure 21. Plot of relative weights (W_r) for individual bluegill sampled by electrofishing Lower Salmon Falls Reservoir, 1987.

Table 19. Mean relative weight (Wr) per 50-mm length group for bluegill sampled by electrofishing in Lower Salmon Falls Reservoir, 1987.

Length group (mm)	Number	Relative weight (Wr)
0-50	1	126
51-100	62	135
101-150	33	118
151-200	5	130

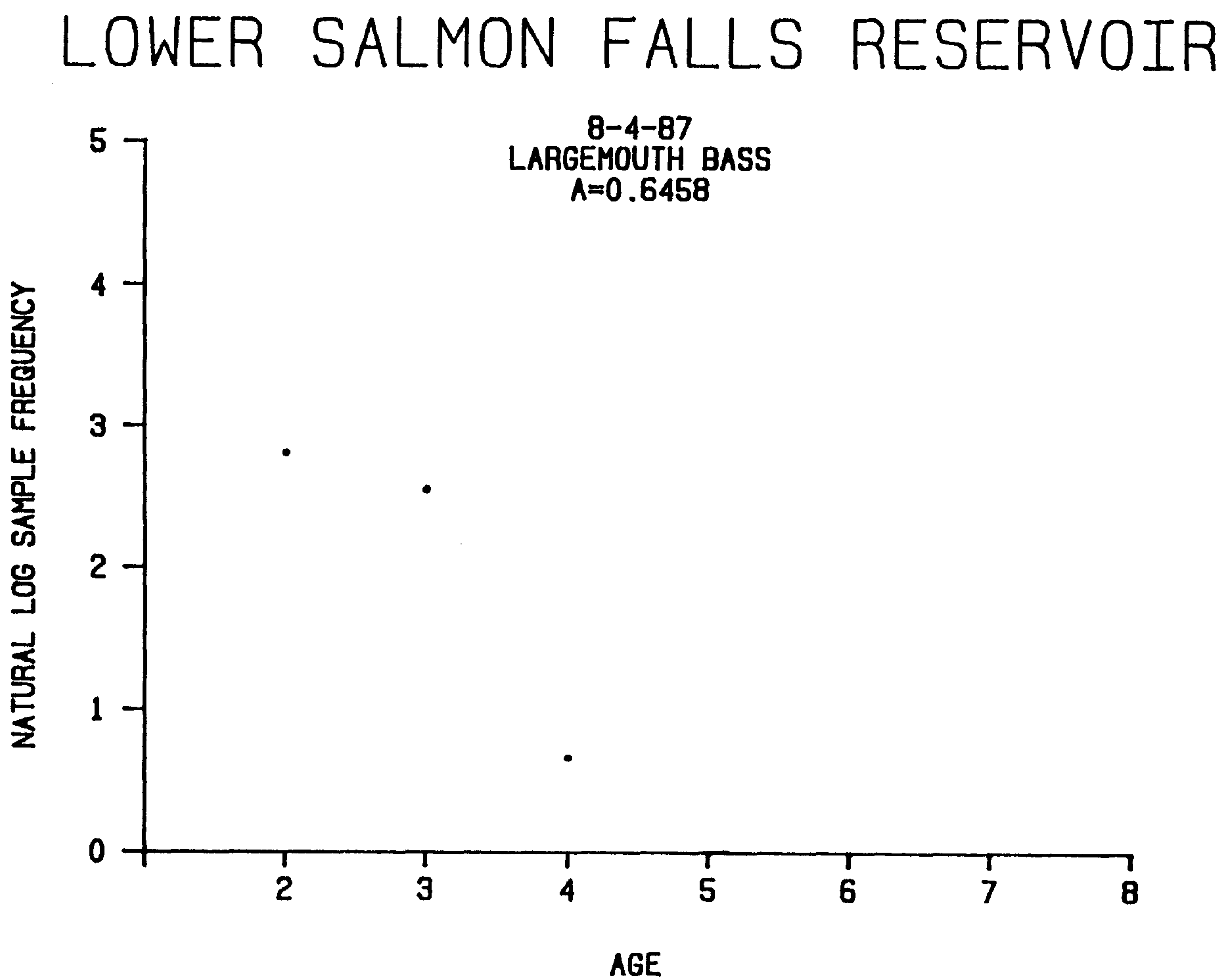


Figure 22. Catch curve generated from electrofishing data for largemouth bass sampled from Lower Salmon Falls Reservoir, 1987.

Table 20. Catch per unit effort (fish/h) using electrofishing gear for largemouth bass and bluegill per 50-mm length group as sampled from Lower Salmon Falls Reservoir, 1987.

	Number		Catch per unit effort (fish/h)	
Length group (mm)	Bass	Bluegill	Bass	Bluegill
0-50	2	1	2	1
51-100	6	62	6	62
101-150	13	34	13	34
151-200	20	5	20	5
201-250	12	0	12	0
251-300	6	0	6	0
301-350	9	0	9	0
351-400	1	0	1	0
401-450	1	0	1	0
TOTALS	70	102	70	102

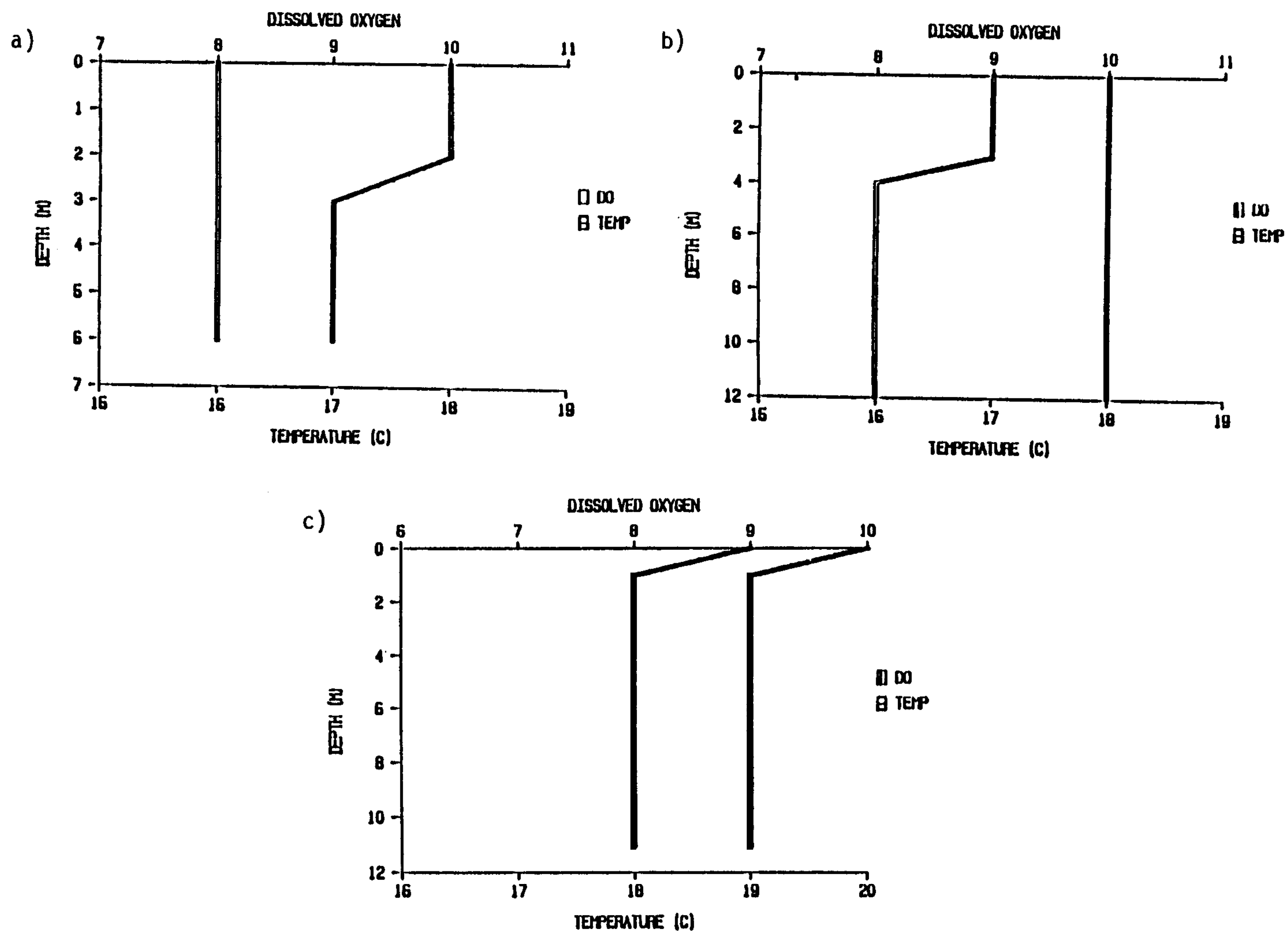


Figure 23. Dissolved oxygen (mg/l) and temperature (^{O}C) profiles from three sampling sites in Lower Salmon Falls Reservoir, August 8, 1987 (a=upper site, b=mid-reservoir, and c=lower site).

Milner **Reservoir**

Gillnetting was conducted in Milner Reservoir at several locations above the dam in June and August 1987 (Figure 24). Eight fish species were collected in six gill nets (Table 21). The primary fish species sampled were Utah chubs (59%) and sucker species (31%). Game fish included yellow perch, channel catfish, smallmouth bass, and mountain whitefish (Prosopium williamsoni), which comprised about 10% of the total sample. Approximately 41 fish per net were caught.

On August 14 and 25, a total of 23 channel catfish were collected in four gill nets (Table 21). Catfish averaged 460 mm in length and ranged from 366 mm to 559 mm (Figure 25). Weight of channel catfish averaged 1.2 kg and ranged from 0.55 kg to 2.4 kg.

Water quality measurements taken on June 24 in Milner Reservoir showed the following results: alkalinity 145 mg/l, hardness 205 mg/l, conductivity 410 mmhos/cm, surface temperature 19°C, and Secchi transparency 0.95 m. A thorough analysis of water quality and the zooplankton community present in Milner Reservoir was documented by Partridge (1987).

Ravenscroft Ranch Diversion Ponds

On September 8, 1987, a total of 75 yellow perch, 33 largemouth bass, 30 bluegill, and 11 smallmouth bass were collected while electrofishing the diversion ponds in approximately one hour of effort. Length frequency distributions per species are found in Figure 26. Largemouth bass averaged 181 mm in length and ranged from 66 mm to 401 mm, while smallmouth bass averaged 148 mm and ranged from 75 mm to 228 mm.

The PSD index for largemouth bass was 28% and for bluegill, 16%. The RSD-380 index for largemouth bass was 14%. The PSD index was not calculated for smallmouth bass since no quality length (280 mm) fish were collected.

Catchable Trout Evaluations

Lower Salmon Falls Reservoir

During the period July 14, 1987 to March 1, 1988, 492 of 5,000 regular jaw tags and 54 of 250 reward jaw tags placed on catchable trout were returned to the Idaho Department of Fish and Game's Region 4 Office. Fish were of the Mt. Lassen strain. From this data, a noncompliance rate of 54.6% was derived. The estimated return-to-the-creel corrected for noncompliance was approximately 23%. Percent return-to-the-creel, based on creel survey data collected from July 16 to December 31, 1987, was 22%.

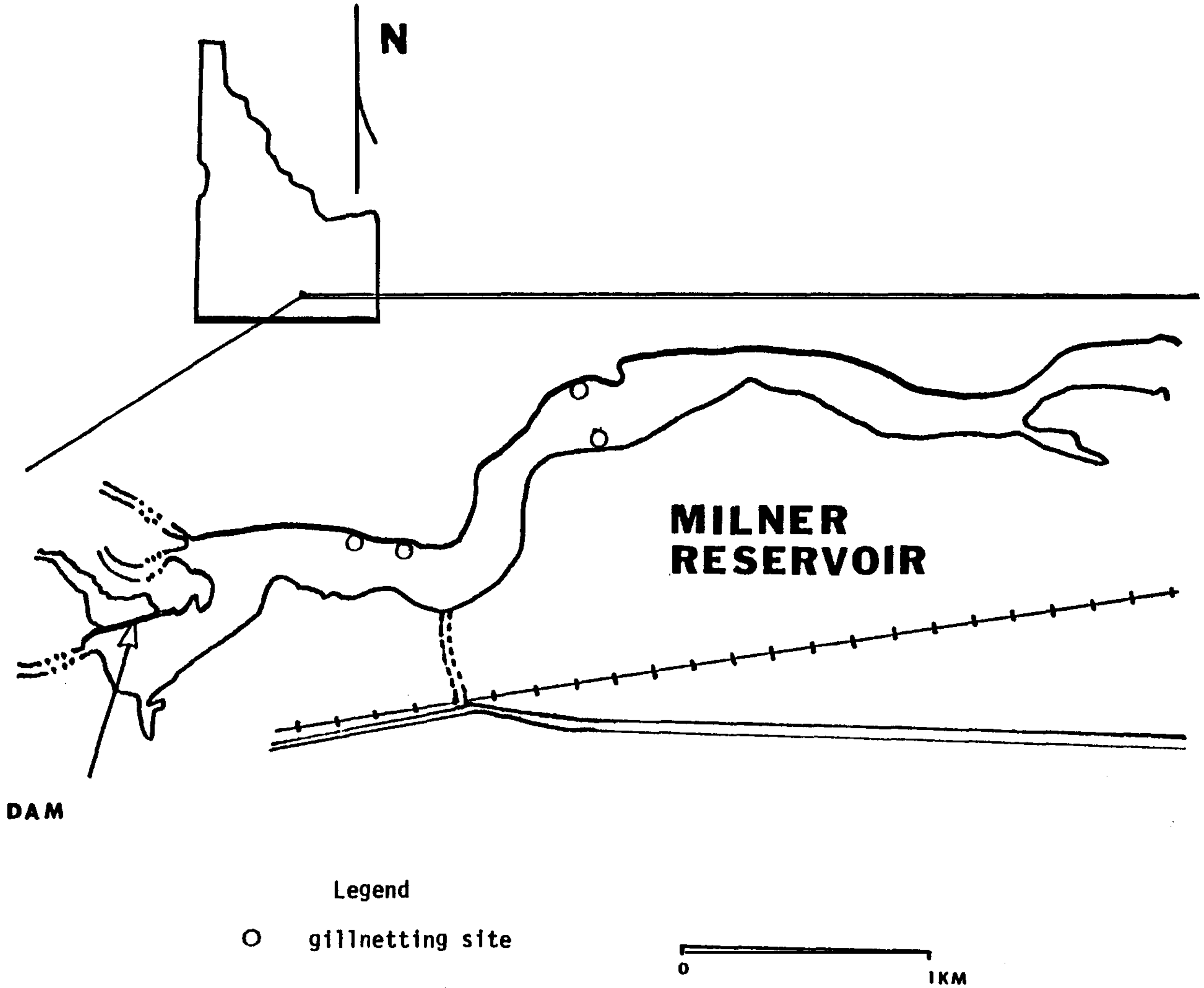


Figure 24. Location map of the lower end of Milner Reservoir denoting gillnetting sampling sites, 1987.

Table 21. Results of gillnetting in area immediately above Milner Dam, 1987. Percentages are in parentheses.

Date	Number of nets	Number per species: YP	CC	SMB	MWF	BBH	SCK	UTC	CRP	Totals	Number fish per net
6-29-87[a]	2	1 (8.3)	1 (8.3)	0 (0)	0 (0)	0 (0)	9 (75)	1 (8.3)	0	12	6.0
8/13-8/14 1987	2	16 (8)	14 (7)	1 (<1)	0 (0)	1 (<1)	70 (33)	106 (51)	1 (<1)	209	104.5
8/24-8/25 1987	2	4 (2)	9 (3)	0 (0)	1 (<1)	2 (<1)	72 (27)	178 (67)	0 (0)	266	133.0
Totals	6	21 (4)	24 (5)	1 (<1)	1 (<1)	3 (<1)	151 (31)	285 (59)	1 (<1	487	40.6

[a]Six hours of daytime effort.

YP = yellow perch, CC = channel catfish, SMB = smallmouth bass, MWF = mountain whitefish, BBH = brown bullhead, SCK = sucker species, UTC = Utah chub, and CRP = carp.

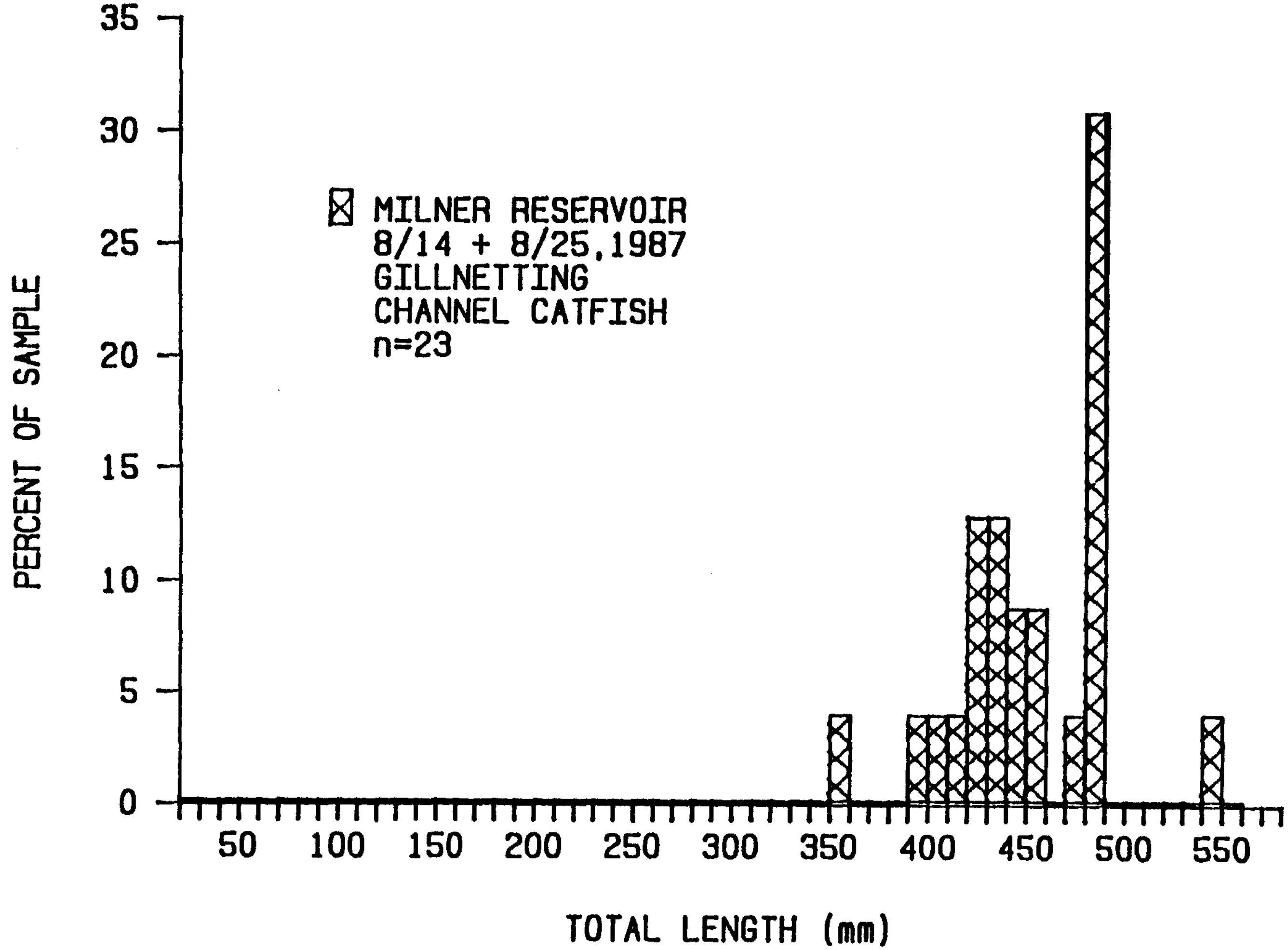


Figure 25. Length frequency diagram of a sample of channel catfish collected with horizontal experimental gill nets from lower Milner Reservoir, 1987.

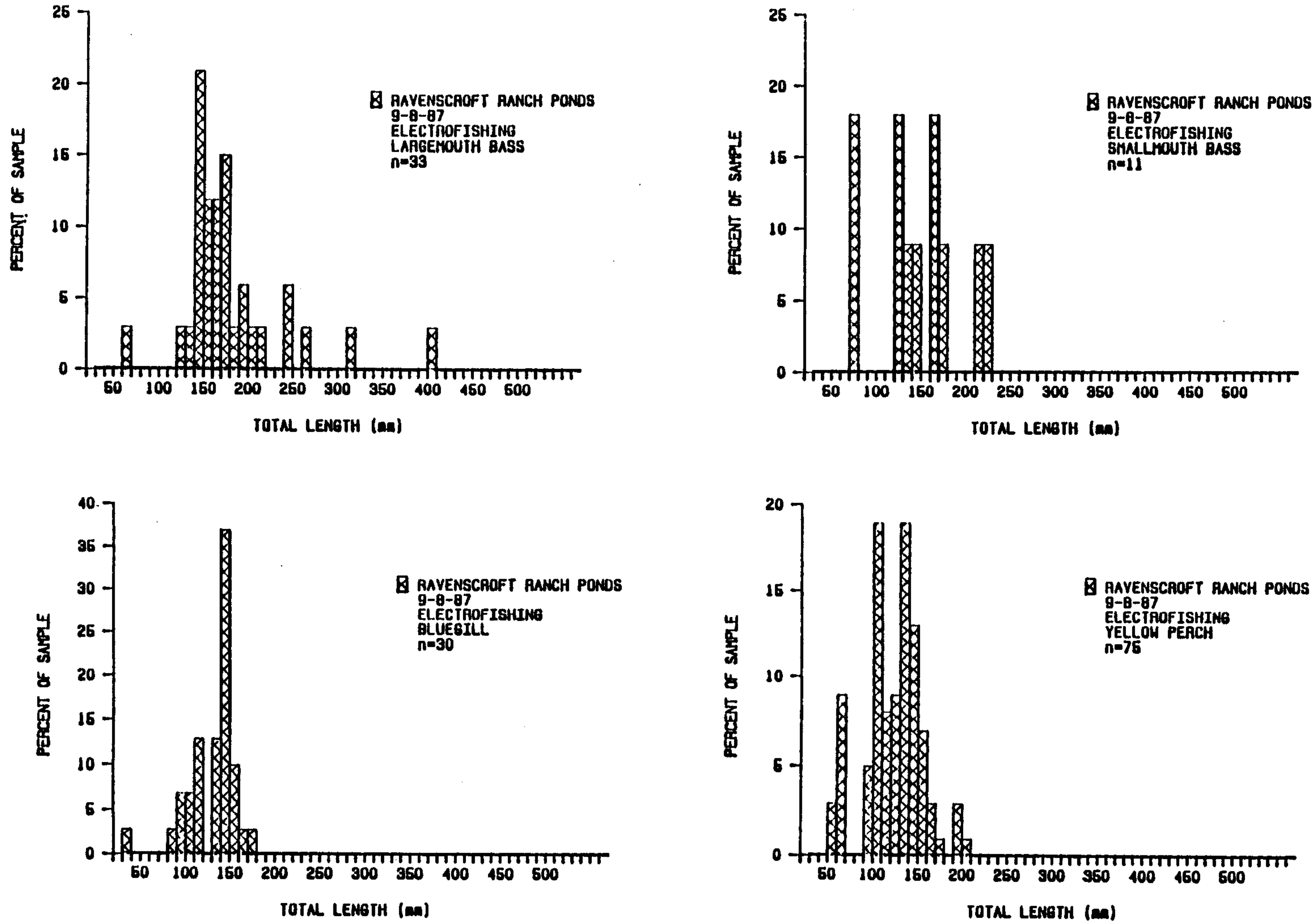


Figure 26. Length frequency diagrams of samples of largemouth bass, smallmouth bass, bluegill, and yellow perch collected by electrofishing the Ravenscroft Ranch diversion ponds, 1987.

Milner **Reservoir**

During the period July 10, 1987 to March 1, 1988, 23 of 1,000 regular jaw tags and **8** of 100 reward jaw tags were returned to the Idaho Department of Fish and Game's Region 4 Office. Fish were of the Mt. Lassen strain. A noncompliance rate of 71% was calculated. The estimated return-to-the-creel corrected for noncompliance was approximately 10%.

Snake River

During the period July 14, 1987 to March 1, 1988, 41 of 2,000 regular jaw tags and 1 of 100 reward tags were returned by anglers. Fish were of the Mt. Lassen strain. A noncompliance rate of nearly 100% was estimated for a corrected return-to-the-creel of 22.

Creel Survey

Information was collected at 22 regional waters on the general opener and 29 locations throughout 1987. Summaries of opening-day general fishing season creel checks and miscellaneous creel checks are found in Tables 22 and 23. A sufficient number of counts was made to provide an estimate of approximately 22,000 hours of angling effort expended on Lower Salmon Falls Reservoir during the period June 1 to December 31, 1987. The catch rate for hatchery rainbow trout estimated during this period was 0.48 trout/h.

DISCUSSION

Anderson Ranch Reservoir

The chinook salmon fishery in Anderson Ranch Reservoir remains sporadic. However, good catches are typically made following ice-off in spring and again in the fall. Salmon in excess of 4.5 kg were not uncommon in the creel in 1987, and one specimen of nearly 7.0 kg was captured during fall gillnetting. Fall chinook salmon were planted in Anderson Ranch during 1982-1984 in an experimental attempt to control an expanding kokanee population. A predatory fish species was needed that would lead to an increase in kokanee growth rates and provide anglers with a trophy fishery. Fall chinook salmon were selected because it was deemed natural reproduction could be controlled (Partridge 1987). A statewide fishery research project was initiated in 1983 to assess the success of fall chinook salmon introductions in selected waters for resident fish programs.

Currently, the status of natural reproduction by fall chinook salmon remains questionable, although the drainage has the capacity to produce a viable chinook salmon fishery. No juvenile salmon of natural origin have

Table 22. Results of creel checks performed at Region 4 waters on opening day (May 23) of the general fishing season, 1987.

Location	Number of anglers interviewed	Hour	Catch rate (fish/h) per species										
			RB	BK	BN	BT	YP	BG	LMB	WE	BBH	BCR	CO
Hagerman WMA	84	172	0.97					0.07			0.0		
Billingsley Creek	10	37	1.32		0.27								
Mormon Reservoir	79	315	0.25		0.01								
South Fork Boise River	33	33	0.90										
Featherville Dredge	8	18	1.38										
Big Smoky Creek	19	26	0.65			0.08							
Magic Reservoir (Hot Springs Landing)	76	229	0.85				0.8						
Magic Reservoir (West Side Landing)	52	110	0.22				0.2						
Dog Creek Reservoir	3	7	0.6										
Malad River	7	11	1.4										
Roseworth Reservoir	76	160	0.9										
Salmon Falls Creek Res.	32	175	0.01							0.02			
Little Wood Reservoir	29	67	1.42										
Little Wood River (above reservoir)	7	44	0.1	0.02									
Little Wood River (Preacher Bridge)	1	3	0.3		0.3								
Sublett Reservoir	80	220	0.2		0.05								0.0
Stone Reservoir	11	24	0.13				0.42		1.7			0.0	
Penny and Dollar Lakes	19	41	1.4										
Trail Creek	8	11	0.5										
Warm Springs Creek	16	26	1.0										
Silver Creek	62	116	0.8		0.13								
Loving Creek	14	62	0.5										
Fish Creek Reservoir	29	130	0.65										
Thorn Creek Reservoir	85	106	3.8										

RB = rainbow trout, BK = brook trout, BN = brown trout, BT = bull trout, YP = yellow perch, BG = bluegill, LMB = largemouth bass, WE = walleye, BBH = brown bullhead, BCR = black crappie, CO = coho salmon.

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Table 23. Summary of miscellaneous spot creel checks performed at Region 4 waters during 1987 to 1988.

Location	Date	Number of anglers interviewed	Hour	Catch rate (fish/h) per species[a]											
				RB	BN	8T	CS	YP	BG	LMB	SMB	WE	BBH	CO	CC
Lake Cleveland	Jun	38	51	1.2											
Little Camas Reservoir	Feb-Jun	51	175	0.2							0.04				
Salmon Falls Creek Res.	May-Jun	163	479	0.08			0.004	0.004			0.003	0.04		0.02	
Snake River (Minidoka Dam tailrace)	Jun-Jul	50	71	0.3											
Magic Reservoir	May-Jul	158	459	0.12				0.44							
South Fork Boise River	May-Aug	128	264	0.9		0.01									
Milner Reservoir	Jun-Aug	41	132	0.05				0.007			0.007		0.2		0.06
Hagerman WMA	Jul	36	68	0.7					0.5	0.2					
Lower Salmon Falls Res.	Jun-Dec	246	659	0.48	0.003				0.009	0.01				0.00	
Snake River (Glenns Ferry)	Jun-Aug	55	112	0.04							0.5				
Lake Walcott (Smith & Gifford Springs)	Feb 1988	15	80	0.13											

[a]See Table 22 for list of species. Additional species: CS = chinook salmon, SMB = smallmouth bass, CC = channel catfish.

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been documented to date. Since chinook salmon have not been stocked in Anderson Ranch Reservoir since 1984, and potential recruitment as a result of the 1982-1984 releases appears inconsequential, this fishery could phase out in 1988, with the remaining fish from the 1984 release attempting to spawn in the fall of 1988. Movement of spawning chinook salmon in tributary streams in the fall of 1987 may have been hampered by low water conditions limiting reproduction. Since the projected water supply outlook for 1988 is expected to be near 701 for the South Fork Boise River drainage, leading to severely depleted fall water flows, the spawning of any remaining chinook salmon also may be jeopardized.

Results of trawling performed at Anderson Ranch Reservoir in 1986 and 1987 suggest the kokanee population is below carrying capacity (F. Partridge, Idaho Department of Fish and Game, personal communication). Partridge (1987) recommended that no additional releases of fall chinook salmon be made in Anderson Ranch until the interspecific effects of this predator on kokanee are well documented. With continuation of trawling at Anderson Ranch Reservoir, and utilization of the permanent fish weir across the South Fork Boise River below Pine, additional data can be collected on kokanee numbers and reproductive success. A predictive computer model will be developed to assist fishery personnel in determining the desired kokanee population level in the reservoir to maintain both a viable kokanee fishery and sustain a trophy chinook salmon fishery.

Bull trout remain an enigma in Anderson Ranch Reservoir and the upper South Fork Boise River drainage. Life history information and population dynamics for the species have not been described in this vast watershed. Further complicating the status of wild bull trout populations in the drainage are the effects of stockings of nearly 250,000 hatchery-reared fish from 1977-1979. A preliminary study will be undertaken in 1988 to evaluate fishery resources present in the South Fork drainage above Anderson Ranch Reservoir. This inventory data will assist the development of a management plan for wild salmonid populations.

Smallmouth bass were originally stocked in Anderson Ranch Reservoir in 1972 primarily as a biological control agent for northern squawfish (Ptychocheilus oregonensis) (Pollard 1973; Beach 1975). A supplemental stocking of bass was made in 1975, and a self-sustaining population was established. A popular two-story fishery for salmonids and bass was developed.

Smallmouth bass indices from 1987 suggest a slow-growing but relatively healthy population. The PSD index of 44% was within the 40 to 60% range considered likely in balanced populations. The overall mean W_r index was near the optimum Wr value of 100, and total annual mortality of 50% is generally lower than summarized by Coble (1975) for 12 smallmouth bass populations in the United States and Canada.

Since maturity of smallmouth bass generally begins at ages II-IV for males and III-V for females (Coble 1975), Anderson Ranch bass could theoretically mature from about 130 mm to 280 mm in length, well under the statewide bass minimum size limit of 305 mm.Growth data indicates smallmouth bass do not attain the 305 mm minimum size in Anderson Ranch until between ages V and VI. In this instance, the length limit does not appear necessary to protect spawning fish but is probably essential to increase the average age and size of bass in the population.

Bray Lake

Due to drought conditions in 1987 and low winter storage of water in Bray Lake during 1987-1988, restocking of the reservoir appears imminent. However, a similar or worse situation may exist during the summer of 1988, and restocking of channel catfish should be deferred until the water shortage improves.

Cow Creek Reservoir

Cow Creek Reservoir has the potential to support a trophy trout fishery if a suitable forage base can be maintained and restrictive regulations adopted. This reservoir would be an invaluable purchase by the Department of Fish and Game since trophy fisheries are in high demand by anglers.

Highway 30 Pond

The potential to manage the Highway 30 Pond for large bass and bluegill remains a viable option. Largemouth bass from this pond exhibit exceptionally good growth for Idaho, attaining the 305 mm minimum size between ages III and IV. It is not documented when southern Idaho largemouth bass stocks reach maturity, but it is suspected to be sooner than reported for northern Idaho stocks which may take up to six years to mature (Goodnight 1980). Although the delayed opening of the fishing season on part of the Hagerman WMA was designed to decrease exploitation of bass, reaction of the public to this regulation has been favorable since they generally perceive this type of regulation to protect spawning fish. Higher growth rates found in southern Idaho may allow faster replacement of exploited length classes then in northern Idaho.

Current regulations appear to have improved bass stock structure significantly since 1984 where Grunder (1986) reported a paucity of large bass in the Highway 30 Pond. A greater percentage of bass are reaching quality size. Not only does this provide a better fishery for anglers, it is critical to support adequate numbers of large bass to maintain balance between predator and forage fish species (Anderson 1973; Davies et al. 1982). The bluegill population seems to be responding positively as indicated by the majority of fish sampled being preferred size (200 mm) or larger. It is suggested this fishery be monitored every two years to assess changes in stock structure and predator-prey relationships.

Lake Walcott

Although Lake Walcott currently supports a large nongame fish community, vast areas of underutilized habitat exist for potential game fish species. The upper end of Lake Walcott provides a suitable environment for hatchery rainbow trout and the Kamloops strain of rainbow trout, both of which are stocked annually. Problems arise in the summer when water temperatures increase. Gebhards (1960) found that, of 3,000 catchable rainbow trout which were jaw tagged and released at the upper end of Lake Walcott, on May 6, 1960, nearly 75Z of those fish which were eventually reported harvested by anglers were caught in the Snake River below Minidoka Dam. This area is situated approximately 14.4 km downstream from the original release site. Within ten days following planting, tagged trout began showing up at Minidoka Dam. These trout were of unknown genetic stock from American Falls Hatchery. It appears that, due to summer water temperatures above optimum for trout, most stocked trout eventually emigrate downstream through Minidoka Dam. A follow-up to the 1960 study will be performed in 1988 by marking both catchable rainbow trout and fingerling Kamloops rainbow trout to assess distribution and return-to-the-creel.

Past stockings of largemouth bass made in the early 1970s in Lake Walcott have proven unsuccessful. Only occasional reports of bass have been made since by anglers and commercial fishermen. No game fish other than yellow perch were collected in gill nets in 1987. Due to the vast forage base and habitat available for potential predator fish species, it is recommended that plantings of both largemouth and smallmouth bass be made in Lake Walcott. It is suggested that fish be planted directly near suitable habitat by boat to improve chances of survival.

Kokanee provided a limited, though popular, fishery in Lake Walcott in the early 1960s. These fish were early spawning Island Park stock and drifted downstream from an upriver source. An occasional kokanee is still harvested in the upper reaches of Lake Walcott near Gifford Springs. If Island Park stock are available, consideration should be given to rehabilitate this potential fishery by stocking. Spawning areas are limited except possibly for Gifford Springs. However, a self-sustaining fishery is probably not feasible, but is not deemed necessary if hatchery fish are available to supplement an ongoing program.

Lake Walcott, at 4,900 hectares in size, remains one of the most underutilized water bodies in Region 4 and most probably in the state of Idaho. Reid (1972) documented only 4,036 total hours of effort expended on Lake Walcott proper from March 29 to October 7, 1971. This equated to only 0.8 h/hectare of fishing pressure. A total catch rate of 0.05 fish/h was reported. By comparison, the spillway and tailrace fisheries below Minidoka Dam received nearly 19,000 hours of effort during April through October 1979 (Hiebert and Bjornn 1980), and the Snake River between the Lake Walcott flowline and American Falls forebay received an estimated 72,000 hours of effort in 1971 (Reid 1972). Lake Walcott has tremendous potential to sustain a high-use, two-story fishery if limiting factors can be ascertained. In 1987, regional personnel were limited by the scope of the project but did collect additional fishery and limnological data.

The Bureau of Reclamation is drafting plans to expand public facilities at Walcott Park in Minidoka County in the near future. The potential exists for significant increases in angling pressure and greater demands for a better quality fishery. Before these demands can be met, more insight concerning the poor quality of the fishery needs to surface. Additionally, increased angling pressure and recreational traffic will be of concern to the U.S. Fish and Wildlife Service, which manages the surrounding Minidoka National Wildlife Refuge (T. Gladwin, USFWS, personal communication).

Lower Salmon Falls Reservoir

In 1987, the percentage (30X) of game fish species collected by gillnetting the Buckeye Cove was nearly identical to the 31% from 1986 reported by Grunder et al. (1987). Idaho Power Company (IPC) personnel electrofished locations along shoreline areas of Lower Salmon Falls Reservoir in 1987. Forty-one percent of the IPC samples were game fish species, comprised primarily of bluegill and rainbow trout (Appendix A). Buckeye Cove supports a thriving warmwater fishery but is somewhat atypical of Lower Salmon Falls Reservoir. Buckeye Cove is typically shallow, with dense growths of aquatic macrophytes, whereas the reservoir proper is a run-of-the-river type impoundment with abrupt, steep banks providing little shoal habitat. The impoundment, in general, is more suited as a trout fishery.

Largemouth bass inhabiting the Buckeye Cove appear to exhibit superior growth rates for an Idaho stock, but few large fish were present in the population. Although the PSD index of 411 suggests a balanced situation, only 14% of bass in the electrofishing sample were legal size (305 mm) or larger, and no bass greater than age IV+ were found. Total annual mortality estimated for this stock in August 1987 was nearly 65%. Reliable harvest estimates for largemouth bass from Lower Salmon Falls Reservoir are not available. Creel checks performed during 1987, however, suggest current angler pressure on bass is relatively light and that exploitation is not the major mortality component affecting stock structure. The lack of bluegill larger than 200 mm may be a result of low numbers of larger bass to effectively control bluegill numbers or reduced predation on bluegill due to dense macrophyte growth.

Milner Reservoir

Channel catfish are doing well in Milner Reservoir and are providing a good fishery in the Burley-Rupert area. Channel catfish are stocked when available. Smallmouth bass stockings have been sporadic. Increased plantings of fingerling smallmouth bass are planned for Milner Reservoir. The lower reaches of the reservoir are characterized by basaltic cliffs and offer exceptional bass habitat. The forage base available for smallmouth bass is unlimited, and regional fishery personnel remain convinced the species will establish a self-sustaining, viable fishery if substantial numbers can be stocked.

Ravenscroft Ranch Diversion Ponds

The Ravenscroft Ranch diversion ponds have the potential to sustain a good warmwater fishery if stable water levels can be maintained. Water levels in the ponds fluctuate based on operation of the hydropower facility and inflow into the storage ponds, which is subject to upstream irrigation demands. The water fluctuations create a relatively dynamic situation which may not be conducive to supporting a quality warmwater fishery. In general, properly handled fall or midsummer drawdowns can increase growth rate and spawning success of bass (Heman et al. 1969). However, spring drawdowns during the bass spawning season can produce poor year classes of largemouth bass (Jester et al. 1969). If the exemptee of the project wishes to enhance the currently existing fishery, fluctuation of water levels must be kept to a minimum if possible, especially during critical developmental stages of bass.

Catchable Trout Evaluations

Lower Salmon Falls Reservoir

The trout fishery at Lower Salmon Falls Reservoir was probably the most consistent in Region 4 during 1987 to early 1988. Since many of the reservoirs located in the northern half of Region 4 were drawn down to meet irrigation demands, angler pressure was deferred to other regional waters later in the season. The 23% return-to-the-creel estimated for Lower Salmon Falls Reservoir is considered by regional fishery personnel justification enough to maintain or enhance current stocking rates of catchable rainbow trout.

The management direction stated in the Idaho Fisheries Management Plan, 1986-1990, for Lower Salmon Falls Reservoir, was to attempt to build the rainbow trout fishery in the Bell Rapids area to its former high quality and increase the number of trout stocked if studies so indicate (Moore et al. 1986). This objective has been accomplished. However, nearly 35,000 catchable trout were stocked in the impoundment both in 1986 and 1987. The regional stocking recommendation was for 20,000 trout for both years. The additional 15,000 trout stocked were available due to increased hatchery production and drought conditions. To maintain a catch rate of at least 0.5 trout/h, it is recommended the total number of trout stocked be a minimum of 35,000 per year, or at least 103 fish/hectare.

Milner Reservoir

The 101 return-to-the-creel estimated for Milner Reservoir in 1987 to early 1988 may be considered low, but this impoundment technically is nearly 50 km long, being a run-of-the-river type. The upper 43 km of the reservoir is shallow (1 to 4 m) and retains the characteristics of a river with a substantially embedded substrate (Partridge 1987). The lower 7 km of Milner Reservoir is deeper (5 to 15 m) and flows through a volcanic lava flow. Most of the jaw-tagged trout were harvested in the vicinity of the Burley Bridge, where they were originally planted. Others moved downstream below Milner Dam, a distance of over 14 km, while some trout ventured upriver as far as 13 km near Declo. It is recommended that future plantings of catchable trout in Milner Reservoir be limited to the lower 7 km and to the Burley-Rupert area to maximize return-to-the-creel.

Snake River

Catchable rainbow trout planted in the Snake River near Glenns Ferry did not return-to-the-creel in appreciable numbers due to minimal angler effort. Catchable trout plantings were bolstered at the request of local anglers who felt the Snake River was underutilized because of poor fishing quality. Regional personnel agreed to experiment with a number of jaw-tagged trout to assess potential harvest and angler participation. Similar studies conducted in Idaho by Chapman (1983) in the North Fork Payette River and by Horner et al. (1987) in northern Idaho rivers generally exhibited substantially higher returns. Although a number of variables such as voluntary participation by anglers and habitat quality and sheer size of the Snake River probably affected accuracy and quality of tag return information, the data collected gives a relative indication of utilization in this area. Planting requests made for the Snake River near Glenns Ferry should be reevaluated due to of findings from 1987.

Creel Survey

Region 4 continues to provide diverse fishing opportunities to anglers for a number of game fish species. Routine creel checks and surveys should be performed annually, or as needed, to continue to assess angler effort and desires and trends in regional fisheries.

ACKNOWLEDGEMENTS

Fred Partridge (Senior Fishery Research Biologist) assisted with nearly every phase of this project and offered valuable advice during the course of the studies. Kieran Donahue and Larry Barrett (Biological Aides) assisted with most field work. Phil Bradfield (U.S. Fish and Wildlife Service) provided accommodations and support while at Lake Walcott. Bob Vaughn et al. gave us much appreciated assistance with jaw-tagging operations at the Hagerman Hatchery. Region 4 conservation officers and regional staff are commended for their efforts in collecting creel data. Vernon Ravenscroft assisted with electrofishing his diversion ponds while Mike Moss aided us at Anderson Ranch Reservoir in the fall of 1987.

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Appendix A. Summary of fishery data collected by Idaho Power Company personnel in 1987 in the Snake River from Shoshone Falls Reservoir to below Bliss Dam.

COLLECTION PERMIT REPORT
Scientific Collection Permits
F-91-85 F-38-87
Snake River, Bliss to Shoshone Projects

During the spring, summer and fall of 1987 fishery surveys were conducted in and around Bliss, Lower Salmon, Upper Salmon and Shoshone Reservoirs by Idaho Power Company biologists. The purpose of these surveys were to assemble a data base of information relevant to Idaho Power Company lands along the Snake River.

Fish were sampled by boat, backpack, and bank electrofishing gear and on one instance gill nets during 52 survey days in 13 general locations (Table 1).

Table 1. General location and date of fishery survey for collection permits F-91-85 and F-38-87.

	0->2 MILES BELOW BLISS RESERVOIR	BLISS RESERVOIR (see below)	TUANA GULCH	CASSIA GULCH
DATES SAMPLED (YYMMDD)	871001 871112	870512 870609 870610 870707 870708 870804 870901 870902 871012 871013	870709 870804 871022	870804

Bliss Reservoir site was encompassed within the reach from the buoy line to the large island downstream of the Shoestring Bridge.

Appendix A. Continued.

Permit report F-91-85 and F-38-87 Table 1 continued

	0->1 MILE BELOW LOWER SALMON RESERVOIR	LOWER SALMON FISH LADDER	LOWER SALMON RESERVOIR	BETWEEN UPPER SALMON A&B PLANTS
DATES SAMPLED (YYMMDD)	870820 871021	870721	870526 870527 870528 870624 870625 870721 870722 870903 870904 871013	870723 870916 871008

	UPPER SALMON RESERVOIR	UPPER SALMON THOUSAND SPRINGS	0->2 MILES BELOW SHOSHONE FALLS	SHOSHONE FALLS RESERVOIR	DEVIL'S CORAL
DATES SAMPLED (YYMMDD)	870528 870529 870625 870722 870904 871021	870625 870722 870915	870728 870729 871109 871110	870514 870611 870715 871028 871029	870818

During the permit period terminal gear was used in one occasion (7/15/87 on Shoshone Reservoir) to check electrofishing efficiency. All fish handled during this collection were taken to the Twin Falls land fill. A biological aid from the Region 4 office was present when nets were pulled from the reservoir.

Several jaw tagged rainbow trout were collected in and below Salmon Falls reservoir. Data on these collections were sent to Region 4 in a letter dated 10/27/87 (see attached letter).

Information gathered during fishery surveys included numbers and length of fish captured, the total number of fish measured for length was 5921 distributed between 13 general locations (Table 2).

Appendix A. Continued.

Permit report F-91-85 and F-38-87 continued

Table 2. Fish numbers, mean total length, minimum total length, maximum total length by area and specie.

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
BLISS RESERVOIR	LARGESCALE SUCKER	773	291	48	555
	SQUAWFISH	231	174	69	444
	REDSIDE SHINER	208	119	36	198
	CHISELMOUTH	146	181	62	326
	CARP	125	495	94	785
	BLUEGILL	56	127	62	174
	RAINBOW TROUT	37	278	154	417
	LARGEMOUTH BASS	29	255	145	350
	MOTTLED SCULPIN	19	80	25	116
	SCULPIN (SPECIES)	15	85	36	102
	SPECKLED DACE	11	68	51	103
	PEAMOUTH	10	206	62	298
	SMALLMOUTH BASS	8	203	176	241
	MOUNTAIN WHITEFISH	8	154	116	176
	BROWN BULLHEAD	6	206	178	222
	COHO SALMON	6	213	182	250
	UTAH SUCKER	1	211	211	211
	TORRENT SCULPIN	1	71	71	71

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
0->2 MILES BELOW BLISS RESERVOIR	LARGESCALE SUCKER	105	371	60	531
	CARP	42	514	376	660
	RAINBOW TROUT	41	310	203	414
	REDSIDE SHINER	28	108	50	155
	MOTTLED SCULPIN	22	85	54	107
	BRIDGELIP SUCKER	17	376	349	428
	MOUNTAIN WHITEFISH	12	298	217	340
	SQUAWFISH	8	406	115	512
	CHISELMOUTH	4	115	72	135
	SMALLMOUTH BASS	4	67	60	75
	SPECKLED DACE	2	34	60	67
	TORRENT SCULPIN	2	83	83	83
	BLUEGILL	1	176	176	176
	BROWN TROUT	1	416	416	416

Appendix A. Continued.

Permit report F-91-85 and F-38-87 Table 2 continued

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
CASSIA GULCH	UNIDENTIFIED	5	38	35	43
	CARP	1	500	500	500
	SCULPIN (SPECIES)	1	90	90	90

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
TUANA GULCH	SQUAWFISH	110	106	46	272
	CHISELMOUTH	18	65	40	96
	LARGESCALE SUCKER	9	62	40	88
	RAINBOW TROUT	2	278	235	320
	BLUEGILL	1	89	89	89
	SPECKLED DACE	1	61	61	61

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
LOWER SALMON FALLS RESERVOIR	LARGESCALE SUCKER	150	343	52	598
	BLUEGILL	148	101	35	183
	RAINBOW TROUT	119	304	54	454
	REDSIDE SHINER	68	76	33	113
	CARP	51	335	50	783
	MOTTLED SCULPIN	42	67	28	111
	CHISELMOUTH	31	138	84	312
	UTAH CHUB	31	132	60	263
	PEAMOUTH	30	183	83	338
	SQUAWFISH	27	258	67	554
	LARGEMOUTH BASS	19	239	104	351
	SPECKLED DACE	14	72	46	92
	BROWN TROUT	12	453	395	503
	YELLOW PERCH	9	195	167	223
	SCULPIN (SPECIES)	6	87	63	106
	BROWN BULLHEAD	2	211	151	270
	COHO SALMON	2	309	262	356
	MOUNTAIN WHITEFISH	2	340	328	351

Appendix A. Continued.

Permit report F-91-85 and F-38-87 Table 2 continued

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
0->1 MILE	LARGESCALE SUCKER	129	352	61	501
BELOW	CARP	65	431	132	686
LOWER	MOUNTAIN WHITEFISH	56	343	160	426
SALMON	MOTTLED SCULPIN	10	83	48	103
FALLS	BROWN TROUT	10	351	318	38
RESERVOIR	TORRENT SCULPIN	8	93	75	116
	SHOSHONE SCULPIN	6	57	45	76
	SPECKLED DACE	6	74	45	106
	BLUEGILL	5	103	88	115
	UTAH CHUB	3	166	138	206
	LARGEMOUTH BASS	2	373	371	375
	SMALLMOUTH BASS	1	73	73	73
	CHISELMOUTH	1	111	111	111

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
LOWER	SPECKLED DACE	15	95	78	136
SALMON	BROWN TROUT	7	322	260	370
FALLS	RAINBOW TROUT	4	278	234	30
LADDER	LARGESCALE SUCKER	2	388	362	413
	SQUAWFISH	1	111	111	111

Appendix A. Continued.

Permit report F-91-85 and F-38-87   Table 2 continued

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
UPPER	LARGESCALE SUCKER	202	374	52	562
SALMON	RAINBOW TROUT	111	290	83	473
FALLS	SQUAWFISH	68	229	99	541
RESERVOIR	CHISELMOUTH	24	174	105	264
	REDSIDE SHINER	19	85	52	126
	PEAMOUTH	15	217	162	354
	SHOSHONE SCULPIN	13	56	40	75
	MOUNTAIN WHITEFISH	7	290	220	350
	LARGEMOUTH BASS	5	174	92	229
	CARP	4	519	82	73
	SPECKLED DACE	4	67	58	83
	SCULPIN (SPECIES)	4	51	22	73
	BLUEGILL	3	166	153	182
	TORRENT SCULPIN	2	94	92	96
	UTAH CHUB	1	300	300	30

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
BETWEEN	REDSIDE SHINER	114	86	41	115
UPPER	LARGESCALE SUCKER	83	358	51	540
SALMON	MOTTLED SCULPIN	59	78	10	139
FALLS	SPECKLED DACE	46	81	43	132
PLANT A&B	RAINBOW TROUT	36	241	45	535
	MOUNTAIN WHITEFISH	27	281	116	388
	CARP	9	572	141	779
	SQUAWFISH	8	143	85	174
	CHISELMOUTH	2	94	93	95
	PEAMOUTH	2	241	159	322

Appendix A. Continued.

Permit report F-91-85 and F-38-87   Table 2 continued

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
THOUSAND SPRINGS / MINI MILLER SPRINGS	RAINBOW TROUT	263	163	59	453
	SPECKLED DACE	35	75	49	107
	SHOSHONE SCULPIN	29	51	38	76
	MOUNTAIN WHITEFISH	25	297	147	353
	LARGESCALE SUCKER	14	461	416	534
	SCULPIN (SPECIES)	8	36	20	65
	REDSIDE SHINER	3	95	62	132
	MOTTLED SCULPIN	1	59	59	59

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
SHOSHONE FALLS RESERVOIR	SQUAWFISH	639	222	75	590
	LARGESCALE SUCKER	167	397	107	526
	CARP	44	399	424	516
	RAINBOW TROUT	5	251	154	333
	REDSIDE SHINER	4	92	71	101
	UTAH CHUB	3	306	296	323
	MOTTLED SCULPIN	1	71	71	71

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
0->2 MILES BELOW SHOSHONE FALLS RESERVOIR	LARGESCALE SUCKER	152	439	54	520
	REDSIDE SHINER	79	85	66	119
	SQUAWFISH	70	300	65	414
	CARP	65	440	375	565
	CHISELMOUTH	9	89	56	240
	SMALLMOUTH BASS	6	59	52	63
	UTAH SUCKER	2	416	403	428
	LARGEMOUTH BASS	1	290	290	290

Appendix A. Continued.

Permit report F-91-85 and F-38-87   Table 2 continued

AREA	SPECIES	NUMBER	MEAN LENGTH (MM)	MINIMUM LENGTH (MM)	MAXIMUM LENGTH (MM)
DEVIL'S	RAINBOW TROUT	32	165	62	258
CORAL CREEK	SPECKLED DACE	20	69	47	92

SNAKE RIVER

HYDRO POWER

Appendix A. Continued.

IDAHO POWER COMPANY

BOX 70 • BOISE, IDAHO 83707

October 27, 1987

Bob Bell Regional Fisheries Manager
Idaho Fish and Game
868 East Main Jerome, ID 83338

Dear Bob;

As requested, I have enclosed a list of the jaw tag recaptures. Please feel free to contact us if you have any questions.

Date	Reservoir	Jaw tag #	Species	Length (MM)	Weight (G)
8-20-87	Below Lower	H4837	RB	240	142
	Salmon Res.	H3998	RB	211	83
9-3-87	Lower Salmon	H8491	RB	270	234
	Res.	H294	RB	262	200
		H3759	RB	365	216
10-13-87	Lower	H2176	RB	292	280
	Salmon	H3241	RB	323	456
	Res.	H4609	RB	304	414
		H2881	RB	357	590
		H449	RB	256	197
10-21-87	Below	H1950	RB	288	260
	Lower Salmon	H1871	RB	252	141
	Res.				

All fish were returned to the water unharmed.

Sincerely,

Chris Randolph

Chris Randolph
Biologist

JOB PERFORMANCE REPORT

State of: **Idaho**

Name: **REGIONAL FISHERY MANAGEMENT INVESTIGATIONS**

Project No.: **F-71-R-12**

Job No.: **IV-c**[1]

Title: **Region 4 River and Stream Investigations**

Period Covered: **July 1, 1987 to June 30, 1988**

ABSTRACT

During June through October 1987, a total of 18 streams were inventoried to collect information concerning fish populations and condition of riparian habitats. Additionally, water chemistry analyses, discharge measurements, and general narratives describing study sections were completed for each stream surveyed.

Condition of stream and riparian habitats was subjectively rated using a modified version of a Bureau of Land Management (BLM) Stream Habitat Condition Evaluation.

Authors:

Scott A. Grunder, Regional Fishery Biologist
Steven C. Elam, Biological Aide
Robert J. Bell, Regional Fishery Manager

INTRODUCTION

This stream inventory was conducted in Region 4 of IDFG to assess the existing status of fish populations and the condition of stream and riparian habitats. Reininger (1978) and Gamblin (1980) performed similar inventories in Region 4. Grunder et al. (1987) described an inventory of 30 streams in southcentral Idaho conducted in 1986. This survey was performed during the summer of 1987 following a below normal precipitation period during the winter of 1986-1987.

OBJECTIVE

To maintain information for fishery management activities and decisions for rivers and streams.

RECOMMENDATIONS

1. Continue to inventory drainages in Region 4 where a paucity of recent biological, chemical, and physical information exists.

2. Contact agencies or individuals responsible for administering lands adjacent to stream corridors and report findings and recommendations.

3. Identify and protect pure populations of Yellowstone cutthroat trout (*Salmo clarki bouvieri*) in Region 4.Consider reintroducing this subspecies in drainages where stocks have been lost due to hybridization and/or habitat degradation.

TECHNIQUES USED

The survey was conducted using techniques identical to those reported by Grunder et al. (1987). No attempt was made to assess temporal distribution of fish populations.

RESULTS AND DISCUSSION

Beaverdam Creek

General. Beaverdam Creek is a fourth order tributary of Goose Creek, originating in the Cassia Division of the Sawtooth National Forest about 25 km south of the town of Oakley. The stream is primarily spring fed. On USFS lands, Beaverdam Creek typically flows through a narrow steep-sided canyon vegetated primarily with sagebrush (*Artemesia tridentata*) and juniper (*Juniperus* sp.). In lower elevations, Beaverdam Creek drains sagebrush-covered uplands.

An irrigation diversion is located approximately 2 km upstream from the confluence with Goose Creek. At the time surveyed, Beaverdam Creek was totally dewatered below this point. Springs and/or subsurface flows reenter the stream about 1 km below the diversion. Two sections of Beaverdam Creek were surveyed, including one above and below the diversion.

Upper Section

General. The upper study section was established on the Left Hand Fork Beaverdam Creek since the main fork was dry. Riparian vegetation is primarily sagebrush, various grasses, and sparse willows (Salix sp.). Stream gradient in this section is low. On July 6, 1987, the Left Hand Fork was discharging about 0.28 cfs. The overall habitat condition rating was 14 (fair) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. Beaverdam Creek was accessed by traveling south from the town of Oakley on the Goose Creek Road for about 25 km and then heading east on private land along Beaverdam Creek Road, an unmaintained dirt road. The upper study section was reached by traveling northwest along an unnamed dirt road towards Mahogany Butte. The upper study section was located at T16S,R20E,S16,NW1/4,NW1/4.

Fish sampled. No fish were sampled while electrofishing 52 m of the Left Hand Fork Beaverdam Creek.

Spawning habitat. Substrate size and condition appears adequate for spawning by trout.

Factors limiting fish production. A general lack of cover in the form of pools, undercut banks, and woody debris was evident. Lower than normal summer flows present during the time of the survey negated a true evaluation of typical fish habitat.

Location of habitat degradation. The general appearance of the Left Hand Fork Beaverdam Creek was of a system in fair to poor condition. A combination of livestock grazing and floods appear to have led to the general lack of cover for fish. Steep, eroded streambanks were present in the entire stream reach.

Recommendations for improvement. Cutthroat are the native trout in the Goose Creek drainage. A combination of poor land use practices probably led to their exclusion from Beaverdam Creek. No specific recommendations are being suggested to improve existing conditions.

Lower Section

General. Beaverdam Creek is a meandering stream in its lower reaches situated in a degraded meadow system. Streambanks were in fair condition, with dense grasses lending to their apparent stability. Sediment covers

Table 1. Habitat condition ratings for individual study sections of streams located in Region 4 of the Idaho Department of Fish and Game, 1987.

Stream	Shading	Bank vegetation	Bank stability[a]	Channel stability	Sedimentation	Instream cover	Total condition rating
Beaverdam Creek (upper)	1	2	2-2	2	3	2	14
Beaverdam Creek (lower)	3	4	3-3	2	1	4	20
Big Piney Creek	3	3	2-2	3	1	4	18
Birch Cr. Exclosure	2	4	2-2	3	1	3	17
Birch Cr. (lower)	1	1	1-1	1	1	1	7
Bluehill Creek	1	3	3-3	3	1	4	18
Coal Bank Creek	- - - - - - - - - - - - Dry at inventory time - - - - - - - - - - - - -						
Cold Creek	1	2	2-2	2	2	3	14
Connor Creek	4	3	3-3	2	2	4	21
Cottonwood Creek	3	4	3-3	3	3	4	23
Edwards Creek	2	3	3-3	4	3	4	22
Emery Creek	1	2	2-2	3	1	3	14
Fall Creek	1	4	4-4	4	3	2	22
Goose Creek (upper)	1	4	3-3	3	3	4	21
Green Creek	4	4	3-3	3	3	4	24
Jay Creek	- - - - - - - - - - - - Dry at inventory time - - - - - - - - - - - - -						
Spring Creek	1	1	1-1	1	2	1	8
Stinson Creek	3	1	2-2	2	2	4	16
Trail Creek	1	4	3-3	2	3	3	19
Trout Creek	2	4	3-3	2	2	4	20
West Fk. Trail Cr.	1	1	1-1	3	2	2	11

[a]The first number indicates the right bank; the second number indicates the left bank (looking upstream.)

Total Condition Rating: 21+ = excellent, 18-20 = good, 14-17 = fair, 9-13 = poor.

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Table 2. Stream habitat data for stream sections surveyed in Region 4 of the Idaho Department of Fish and Game, 1987.

Stream	Date surveyed	Discharge (cfs)	Mean stream width (m)	Mean stream depth (cm)	Water temperature (°C)	pH	Dissolved oxygen (mg/L)	Specific conductivity (umhos/cm)	Turbidity	Slope (%)
Beaverdam Creek (upper section)	7-6-87	0.28	0.96	2.46	16.6	8.5	15	450	Clear	2
Beaverdam Creek (lower section)	7-7-87	1.46	1.17	15.28	15.5	8.5	15	410	Clear	1
Big Piney Creek	7-9-87	1.38	2.17	5.37	19	8.5	16	100	Clear	4
Birch Creek (Exclosure)	6-25-87	--	--	--	19	9.0	14	400	Clear	--
Birch Creek (lower section)	6-25-87	1.23	1.41	5.42	27	9.0	14	400	Clear	--
Bluehill Creek	7-7-87	0.45	0.91	7.30	15	8.5	18	237	Clear	3
Coal Bank Creek	7-8-87	Dry	--	--	--	--	--	--	--	--
Cold Creek	6-29-87	2.78	2.93	6.52	21	8.5	15	250	Clear	5
Connor Creek	7-27-87	1.03	1.33	8.08'	16	7.0	7.3	60	Clear	9
Cottonwood Creek	8-4-87	2.18	2.61	6.48	15.5		10.4		Clear	6
Edwards Creek	7-24-87	1.29	1.37	5.94	13	7		70	Clear	11
Emery Creek	7-8-87	0.28	.95	2.28	19	8.5	14	400	Clear	4
Fall Creek	6-30-87	18.2	2.48	17.27	15	8.5	15	260	Clear	
Goose Creek	7-15-87	2.38	3.16	10.46	19	6.5	7.9	62	Clear	3
Green Creek	8-4-87	6.25	2.56	13.61	13.3		13.9		Clear	7
Jay Creek	7-23-87	Dry	--	--	--	--	--	--	--	--
Spring Creek	7-7-87	0.15	.61	2.70	11	8.5	15	790	Clear	4
Stinson Creek	7-27-87	1.79	2.42	5.75	21	7.0	11.2	58	Clear	8
Trail Creek	8-11-87	56.6	7.52	27.69	14	7.0	6.4		Clear	6
Trout Creek	6-23-87	1.03	1.64	2.53	17	8.5	16	280	Clear	
West Fk. Trail Cr.	10-6-87	12.4	3.84	13.18	8	--	--	--	Clear	1

the entire substrate in the lower section of Beaverdam Creek. On July 8, 1987, a discharge of approximately 1.4 cfs was measured. The lower section of Beaverdam Creek received an overall habitat condition rating of 20 (good). Physical and water chemistry data are found in Table 1.

Accessibility. The lower reach of Beaverdam Creek was accessed the same as the upper study section. The lower study section was located 2.6 km upstream from the Goose Creek Road on BLM-administered land, T16S,R21E,S29,SE1/4,SE1/4.

Fish sampled. While electrofishing 71 m of lower Beaverdam Creek, a total of 14 leatherside chubs (Gila copei), 5 speckled dace (Rhinichthys osculus), 1 redside shiner (Richardsonius balteatus), and 5 suckers (Catostomus sp.) were collected.

Spawning habitat. Spawning habitat for salmonids would be extremely limited due to sedimentation of the streambed.

Factors limiting fish production. The loss of suitable spawning areas for trout and general sparseness of deeper water for cover due to sedimentation appear to limit production.

Location of habitat degradation. A multitude of factors have led to the overall degraded condition of Beaverdam Creek, primarily livestock grazing and water diversions.

Recommendations for improvement. Federal agencies responsible for judicious management of public lands adjacent to Beaverdam Creek should reconsider the current allotment management plans in an effort to rehabilitate the riparian ecosystem.

Big Piney Creek

General. Big Piney Creek is a third order stream originating in the Cassia Division of the Sawtooth National Forest about 6.5 km north of the Idaho-Nevada boundary. Big Piney Creek is a tributary to Goose Creek and eventually drains south into Nevada. The headwaters are situated in conifer-aspen forest, and the lower uplands are typically sagebrush-covered situated in a ravine. Streambanks in the lower reaches are erosive, and sloughing banks of 1 to 2 m are present. Big Piney Creek is typically wide and shallow with aquatic vegetation covering the substrate in the lower reaches. Evidence of significant livestock use in the past exists; however, riparian vegetation is recovering. Several beaver ponds were present in the headwater area. On July 9, 1987, stream discharge was measured at about 1.4 cfs. The overall habitat condition rating was 18 (good). Physical and water chemistry data are found in Table 2.

Accessibility. Big Piney Creek was accessed via the Trapper Creek Road southwest of the town of Oakley and then heading southwest along the Piney Cabin Road. The study section was located about 7 km north of the Idaho-Nevada border on USFS land, T16S,R19E,S27,NE1/4,SE1/4.

Fish sampled. While electrofishing 55 m of Big Piney Creek, a total of 12 brook trout (Salvelinus fontinalis), 16 sculpin (Cottus sp.), and 1 speckled dace were collected. Brook trout averaged 95 mm in length and ranged from 54 mm to 154 mm (Figure 1). A population estimate of 145 trout/km $\pm$ 47 was derived. The density estimate of trout in the sample reach was 11.3 trout/100 m^2.

Spawning habitat. Spawning areas for trout are limited due to sedimentation; however, brook trout are successfully reproducing as evidenced by young-of-the-year fish sampled by electrofishing.

Factors limiting fish production. Sedimentation has resulted in the loss of cover for trout and possibly limits benthic invertebrate production.

Location of habitat degradation. Eroding stream banks are a source of sediment, and their origin can probably, in part, be traced to poor land use practices. Condition of the riparian zone appears to be improving.

Recommendations for improvement. Continue proper management of stream **riparian area.**

Uniqueness. At one time, Big Piney Creek probably supported a population of the native Yellowstone cutthroat trout.

Birch Creek

General. The livestock exclosure was built in approximately 1974 (Kirk Koch, BLM, personal communication). This area appears to be improving, with riparian vegetation recovering well within the exclosure. Streambanks are unstable in places, with 2 to 3 m sloughing banks present. Birch Creek receives an annual stocking of about 1,500 catchable-size rainbow trout. The overall habitat condition rating was 17 (fair). Physical and water chemistry data are found in Table 2.

Accessibility. The exclosure study section was located abut 22 km south of the town of Oakley on the Goose Creek Road and then 8 km southeast along the Birch Creek Road, T16S,R22E,S32,SE1/4,SE1/4.

Fish sampled. While electrofishing 80 m of the exclosure, one cutthroat trout and seven brook trout were collected. The cutthroat trout measured 237 mm in length. Brook trout averaged 61 mm and ranged from 34 to 137 mm in length (Figure 2).

Spawning habitat. Spawning areas for trout are limited because of sediment.

Factors limiting fish production. The general lack of suitable cover for trout is a primary limiting factor, although this area is far superior in condition to the rest of Birch Creek. Sediment probably limits reproductive success of trout. Cutthroat trout have been virtually eliminated from Birch Creek by a myriad of factors.

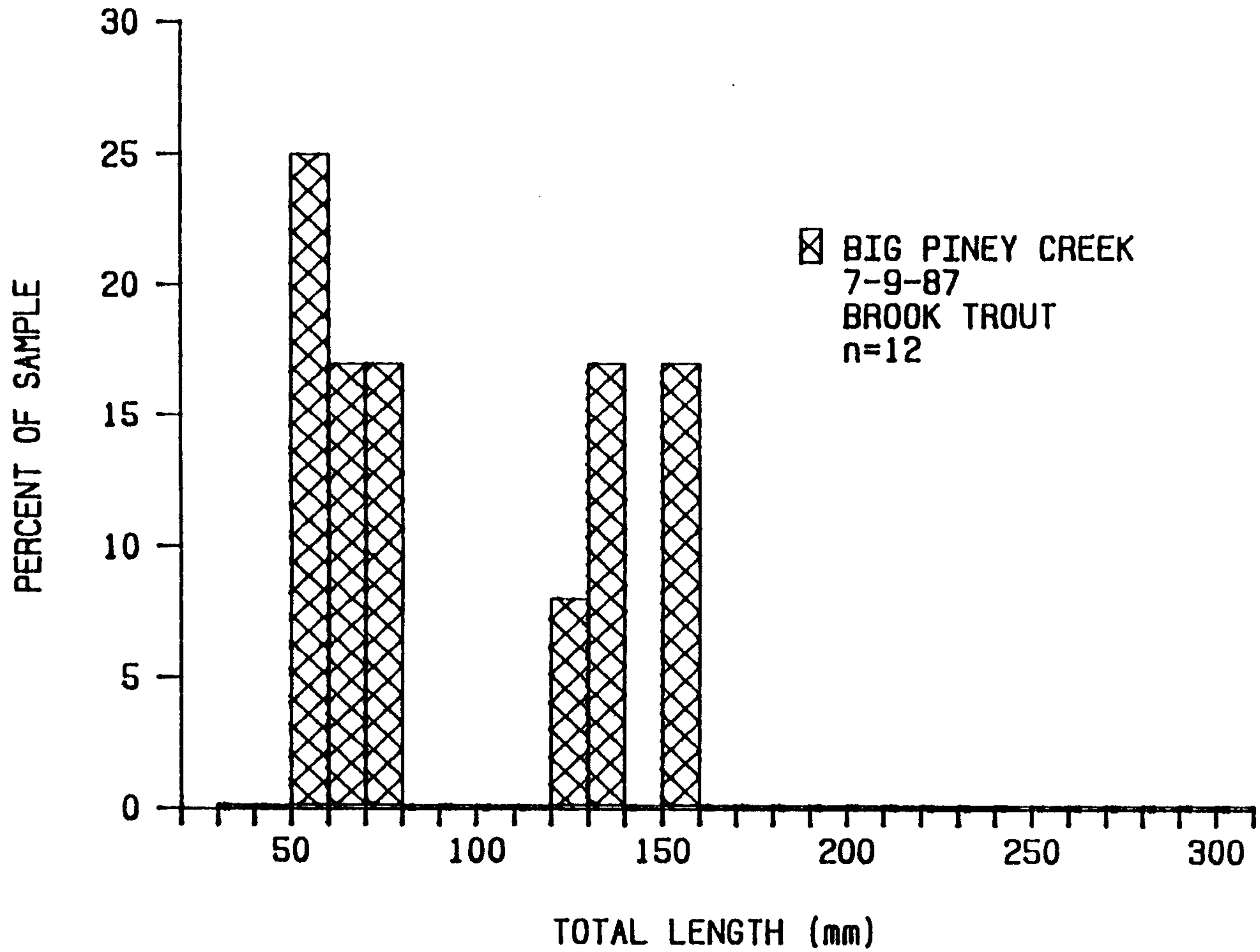
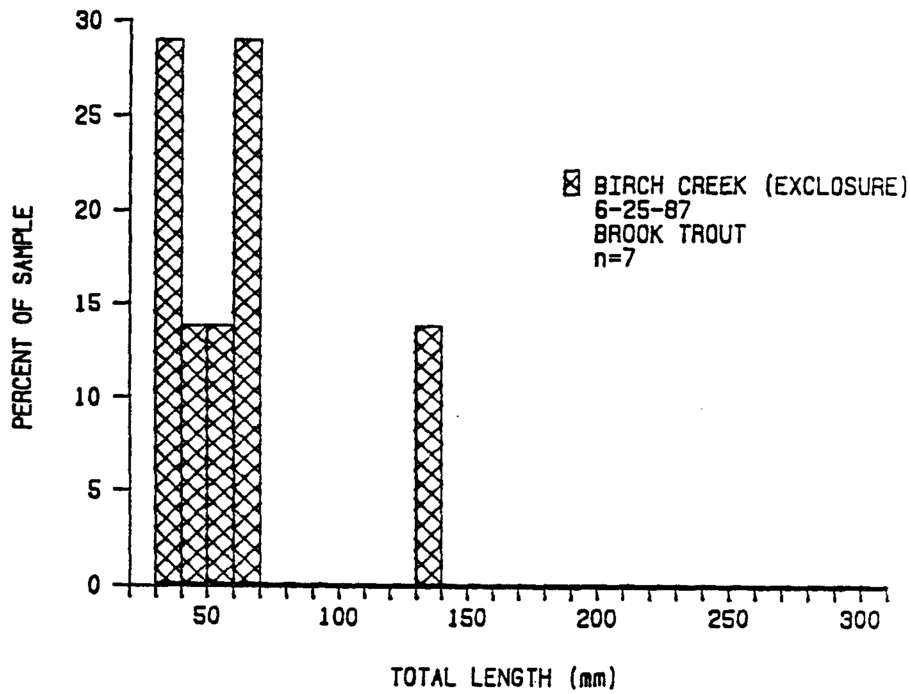


Figure 1. Length frequency diagram of a sample of brook trout collected by electrofishing Big Piney Creek, 1987.



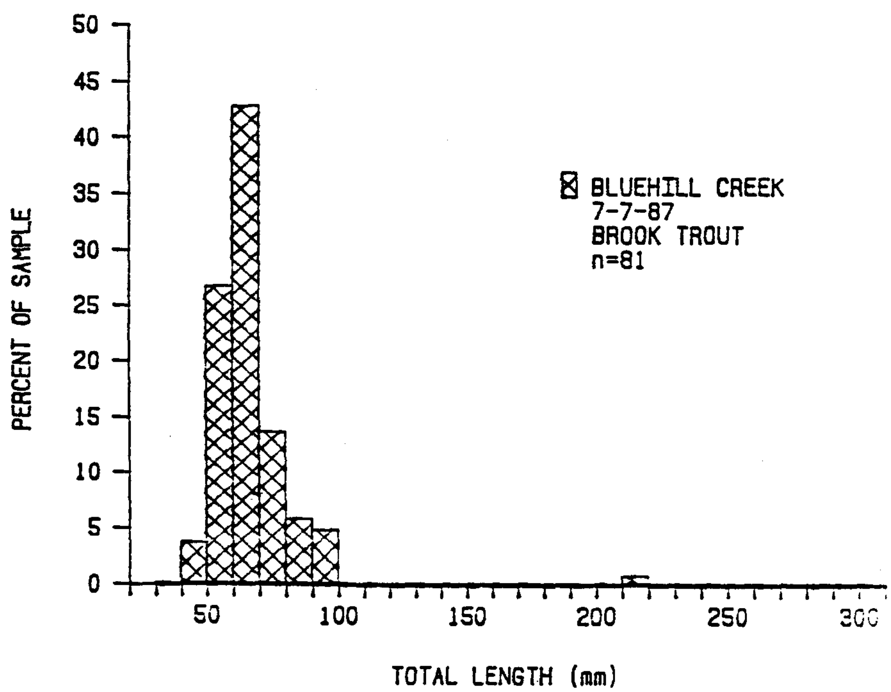


Figure 2. Length frequency diagrams of brook trout populations sampled by electrofishing in Birch Creek (exclosure section) and Blue Hill Creek, 1987.

Location of habitat degradation. The area within the exclosure is still recovering after 13 years of rest from livestock grazing. Previous land use practices in the exclosure and current practices on adjacent lands may continue to set back marked improvements in stream condition.

Recommendations for improvement. Maintain the exclosure fence and consider creating additional cattle exclosures.

Uniqueness. Cutthroat trout still exist in remnant numbers in Birch Creek.

Lower Section

General. In lower reaches, Birch Creek flows through a wide sagebrush-covered valley. In the lower study section, the creek is typically wide and shallow with sloughing streambanks. Significant livestock use has caused a severe deterioration of the drainage. Riparian vegetation is basically nonexistent. Water temperature approached 30°C on June 25, 1987 in the lower study section as compared to 19°C in the exclosure. Water discharge was approximately 1.2 cfs. The overall habitat condition rating was 7 (below poor) (Table 1), the lowest of any stream section surveyed in 1987. Physical and water chemistry data are found in Table 2.

Accessibility. The lower study section was located on private land approximately 3 km upstream from the confluence with Goose Creek, T16S,R21E,S25,NW1/4,SW1/4.

Fish sampled. While electrofishing 112 m of lower Birch Creek, no fish were collected during two passes.

Spawning habitat. Spawning habitat in this reach is nonexistent due to sedimentation of the substrate.

Factors limiting fish production. The vast majority of Birch Creek is in poor condition and remains unsuitable for trout production. Livestock grazing and most assuredly other land uses has decimated this former cutthroat trout stream.

Location of habitat degradation. Except for the small exclosure on BLM land, Birch Creek is a continuously degraded stream system. Virtually no suitable trout habitat exists. Typical riparian plants are completely absent.

Recommendations for improvement. The BLM should consider restructuring current allotment management plans to allow some recovery of the riparian zone along Birch Creek. The apparent slow recovery of the riparian within the exclosure is discouraging, but it does suggest excluding cattle or allowing limited use by livestock shows promise in rehabilitating Birch Creek.

Blue Hill Creek

General. Blue Hill Creek is a third order tributary to Goose Creek, originating in the Middle Mountains south of Oakley. Terrain the stream drains is typical Great Basin high desert predominated by sagebrush and junipers. On July 7, 1987, Blue Hill Creek was discharging about 0.45 cfs. The overall habitat condition rating was 18 (good) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The study area was located approximately 500 m upstream from the end of Blue Hill Creek Road, T16S,R22E,S18,NE1/4,NW1/4, on BLM land.

Fish sampled. While electrofishing 21 m of Blue Hill Creek, 81 brook trout were collected in two passes. Brook trout ranged from 47 mm to 210 mm, with an average length of 67 mm (Figure 2). A population estimate of 4,194 trout/km $\pm$ 240 was derived. The density estimate of trout in the sample reach was 460.9 trout/100 m^2.

Spawning habitat. Sedimentation is minimal in most of the system. Reproductive success appears to be excellent.

Factors limiting fish production. Brook trout are thriving in the drainage. Cutthroat trout are absent from Blue Hill Creek and were probably excluded following the introduction of brook trout.

Location of habitat degradation. There was some indication of livestock damage in the lower reaches; however, most of Blue Hill Creek was in fair to good shape.

Recommendations for improvement. No recommendations are made to improve existing conditions.

Coal Bank Creek

General. Coal Bank Creek is an intermittent stream which was dry on July 7, 1987. All springs which at one time fed the stream have been fully developed for livestock watering. The entire drainage has been severely overgrazed and coupled with flooding, the area has been gullied.

Cold Creek

General. Cold Creek is a third order tributary of Goose Creek, originating in the Middle Mountains. The stream is located in a V-shaped canyon vegetated with sagebrush and juniper. Cold Creek is wide and shallow with moderate amounts of woody debris and other structural components. Eroding stream banks are common, and in some instances are 1 to 2 m high. Riparian vegetation is sparse in the lower reaches, but increases in an upstream direction. Reconstruction of the road in 1987 appears to have had some deleterious effects, especially loss of riparian habitat and sedimentation of the streambed. On June 29, 1987, Cold Creek was discharging about 2.4 cfs. The overall habitat condition rating was 14 (fair) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The study area was reached by traveling south on the Goose Creek Road to Wilson Pass, then heading southeast on an unnamed road which intersects Cold Creek. The area surveyed was located about 4 km above where Cold Creek crosses the Goose Creek Road, T15S,R22E,S21,NW1/4NE1/4, on BLM land.

Fish sampled. Twenty-nine cutthroat trout were collected while electrofishing 60 m of Cold Creek. Cutthroat trout ranged in length from 37 mm to 126 mm, with a mean of 56 mm (Figure 3). A population estimate of 615 cutthroat trout/km $\pm$ 120 was derived. Purity of this population remains questionable. The density estimate of trout in the sample reach was 21 trout/100 m^2.

Spawning habitat. Although natural reproduction obviously occurs, condition of spawning areas is marginal due to fine sediment.

Factors limiting fish production. Encroachments on the riparian area by heavy machinery, livestock grazing, and floods have caused habitat problems. Instream cover is limited as are undercut banks. Stream shading is generally below optimum due to the overall sparseness of riparian vegetation.

Location of habitat degradation. This drainage has experienced several problems, most notably road repair encroaching near the riparian zone, overgrazing, and flooding.

Recommendations for improvement. More stringent guidelines need to be incorporated when repairing roads/culverts on public lands. The status of native cutthroat trout needs higher priority in southern Idaho than currently afforded.

Uniqueness. A viable reproducing population of cutthroat trout (purity unknown) exists in Cold Creek.

Connor Creek

General. Connor Creek originates in the Albion Mountain Division of the Sawtooth National Forest and is a fourth order tributary of Cassia Creek. The riparian zone was in good condition, consisting primarily of alder (*Alnus* sp.), willows, and birch. Instream cover for fish is also prevalent.

Mining activities have occurred in the general vicinity of Connor Creek in the recent past. Livestock use was occurring during the survey period. On July 27, 1987, Connor Creek was discharging about 1 cfs. The overall habitat condition rating was 21 (excellent) (Table 1). Physical and water chemistry data are found in Table 2.

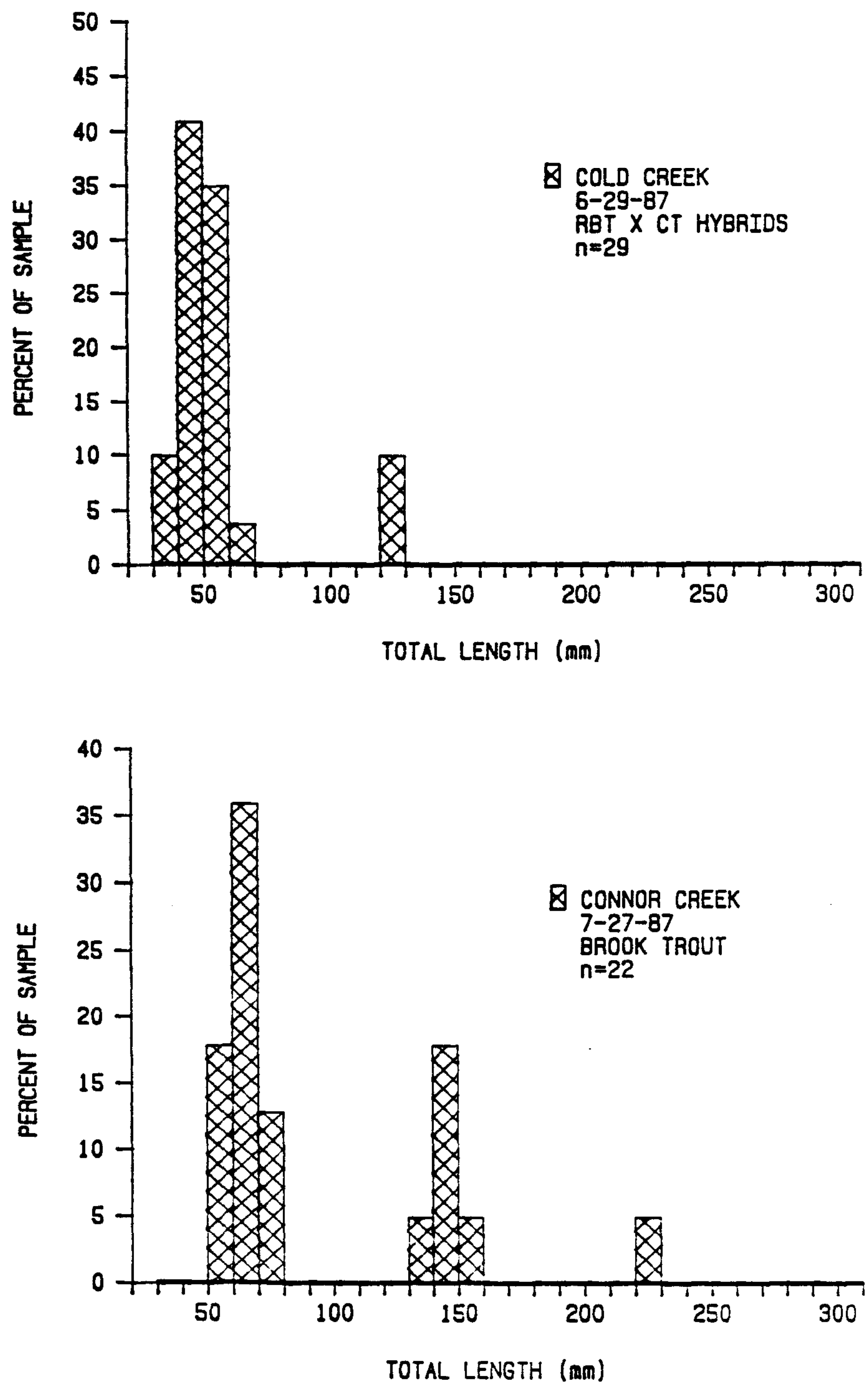


Figure 3. Length frequency diagrams of samples of trout populations collected by electrofishing in Cold Creek and Conner Creek, 1987.

Accessibility. The study section was located about 4 km upstream from the Connor-Elba road crossing, T13S,R25E,S17,NE1/4NE1/4, on U.S. Forest Service **land.**

Fish sampled. While electrofishing 32 m of Connor Creek, a total of 22 brook trout were collected. Trout averaged 94 mm in length and ranged from 55 mm to 222 mm (Figure 3). A population estimate of 701 brook trout/km $\pm$ 18 was derived. The density estimate of trout in the sample reach was 52.7 trout/100 m^2.

Spawning habitat. Spawning areas suitable for brook trout do not appear to be a limiting factor.

Factors limiting fish production. There does not appear to be any obvious factor limiting brook trout survival. Cutthroat trout have been excluded from the drainage.

Recommendations for improvement. There are no recommendations being made to improve habitat conditions in Connor Creek.

Cottonwood Creek

General. Cottonwood Creek is a third order tributary of Cassia Creek, originating on the west slope of the Jim Sage Mountains. Beaver dams are common in the system. Cottonwood Creek is partially diverted in its lower reach for agricultural purposes. On August 4, 1987, Cottonwood Creek was discharging about 2.2 cfs. The overall habitat condition rating was 23 (excellent) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The study area was reached by traveling south of Connor approximately 5 km and then turning east on the Cottonwood Creek road. The area surveyed was located on U.S. Forest Service lands, T13S,R24E,S23,SE1/4NW1/4.

Fish sampled. While electrofishing 51 m of Cottonwood Creek, a total of 61 brook trout and 9 cutthroat x rainbow trout hybrids were collected. Brook trout averaged 107 mm in length and ranged from 50 mm to 217 mm (Figure 4). Population estimates of 1,953 brook trout/km $\pm$ 321 and 234 hybrid trout/km + 117 were derived. Hybrid trout ranged from 86 mm to 206 mm in length, with an average length of 115 mm. Density estimates for brook trout and hybrids in the sample reach were 74.9 and 9.0 trout/100 m^2, respectively.

Spawning habitat. Spawning habitat appears limited because of sedimentation; however, successful natural reproduction obviously occurs.

Factors limiting fish production. Other than slightly degraded spawning habitat, no additional limiting factors were identified. Hybrid trout appear to be competing poorly with the non-native brook trout.

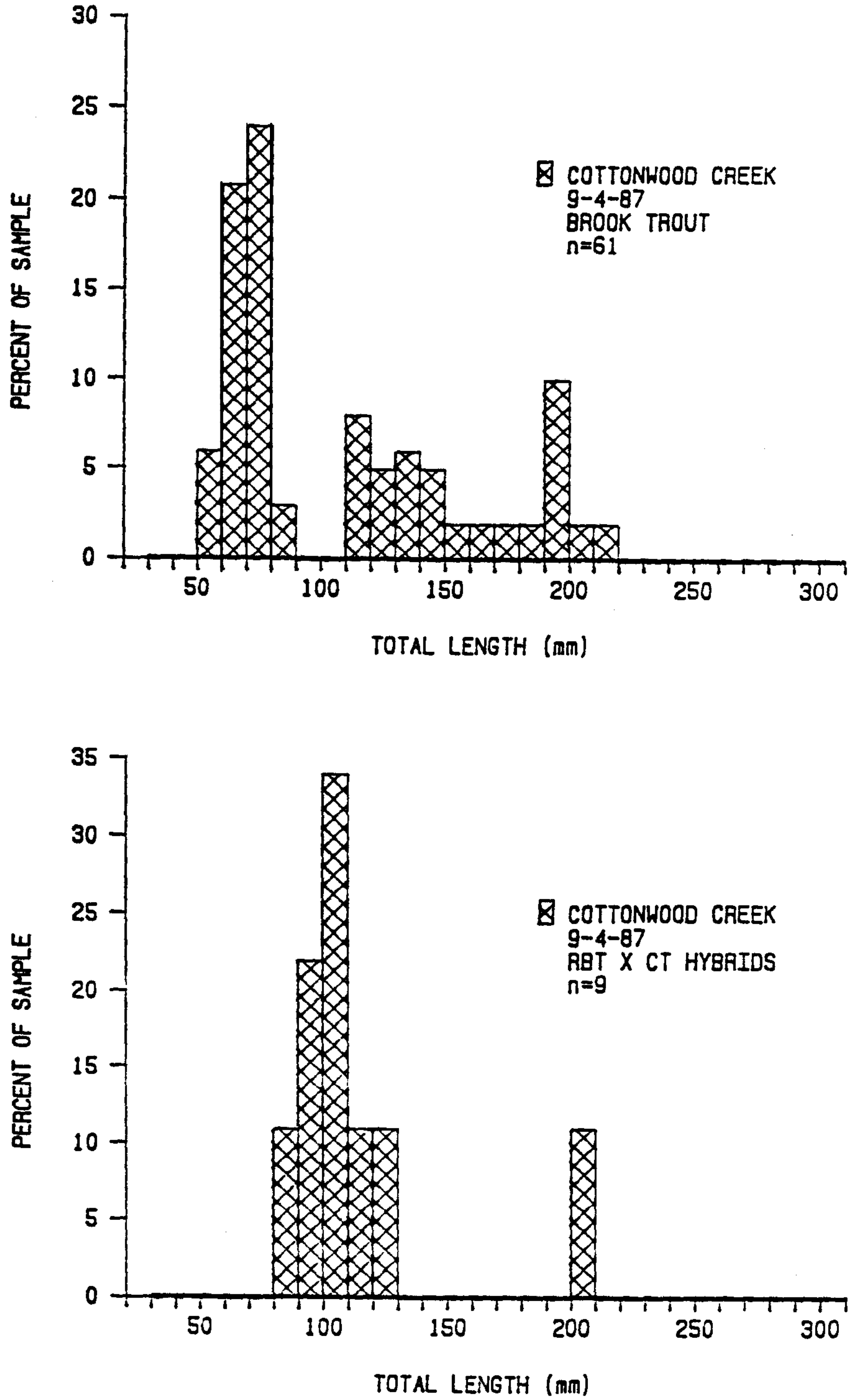


Figure 4. Length frequency diagrams of samples of trout populations collected by electrofishing Cottonwood Creek, 1987.

Location of habitat degradation. Livestock were observed in the survey area but did not appear to have caused significant damage in the riparian zone.

Recommendations for improvement. Maintain the existing excellent condition of the Cottonwood Creek drainage.

Uniqueness. Cutthroat trout were obviously present in Cottonwood Creek prior to the introduction of non-native salmonids.

Edwards Creek

General. Edwards Creek is a fourth order tributary to the Raft River, originating in the Albion Mountains on U.S. Forest Service land. Riparian vegetation is well developed and consists mostly of willows, alder, and chokecherry (Prunus virginiana). The stream has developed into a series of cascades and mild waterfalls. In the lower reaches, Edwards Creek is diverted for agricultural purposes. Livestock use was evident but may be somewhat limited by steep streambanks. On July 24, 1987, a discharge of about 1.3 cfs was measured. The overall habitat condition rating was 22 (excellent) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The study section was located approximately 3.2 km north of Almo and then accessed by heading west through the Little Cove Ranch on private land. The study section was immediately below U.S. Forest Service boundary, T14S,R24E,S4,NW1/4SE1/4.

Fish sampled. Nine rainbow x cutthroat trout hybrids were collected while electrofishing 85 m of Edwards Creek. Trout ranged in size from 64 mm to 188 mm and averaged 116 mm in length (Figure 5). A population estimate of 144 trout/km $\pm$ 49 was derived for Edwards Creek. The density estimate of trout in the sample reach was 10.5/100 m^2. Trout exhibited definite rainbow trout characteristics, so it appears the purity of this native cutthroat trout population has been compromised.

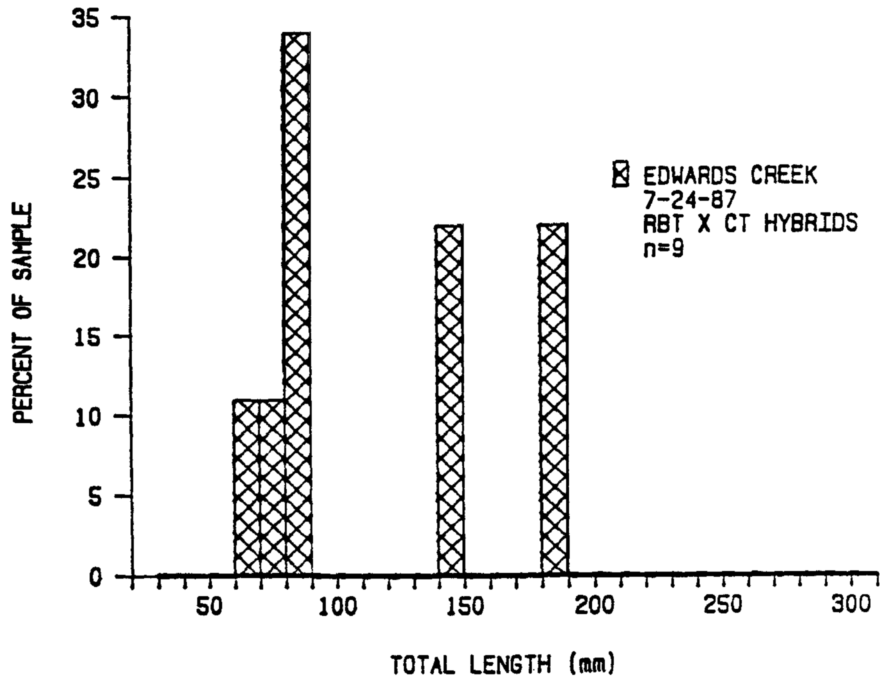
Spawning habitat. Possible spawning areas for trout appear to be in excellent condition.

Factors limiting fish production. Streambank cover is limited in abundance. Pools are prevalent but do not provide much water depth for trout cover.

Recommendations for improvement. No specific recommendations are made to enhance conditions at Edwards Creek.

Emery Creek

General. Emery Creek is a second order tributary to Goose Creek, originating in the Middle Mountains approximately 20 km south of Oakley. The uplands surrounding Emery Creek are vegetated primarily with sagebrush



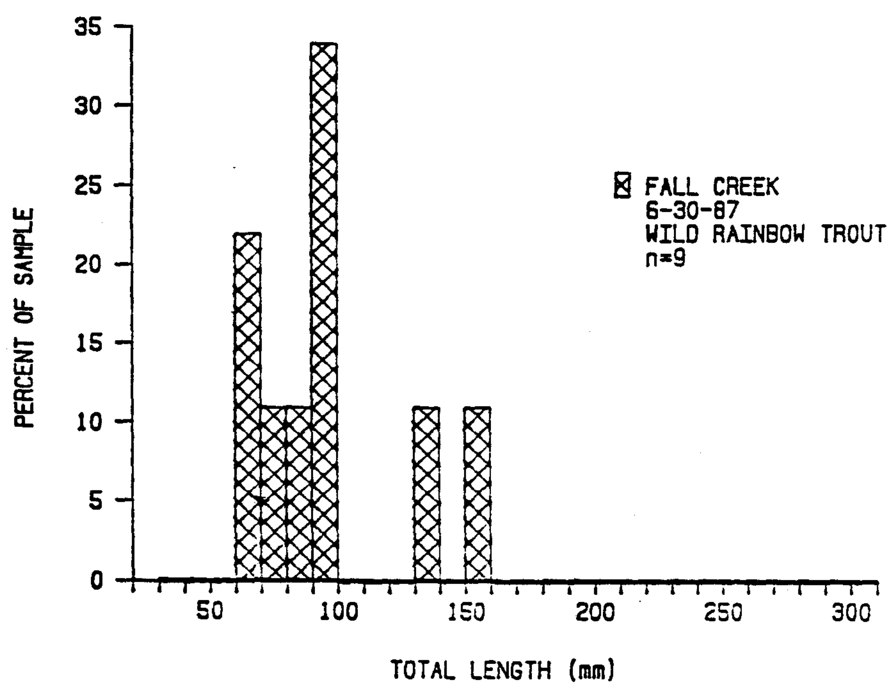


Figure 5. Length frequency diagrams of samples of trout populations collected by electrofishing Edwards Creek and Fall Creek, 1987.

and juniper. Emery Creek is a small stream with a cobble-boulder type substrate. An apparent fish migration barrier is located about 1.6 km upstream from the mouth in the form of a 1 m high cascade. This cascade was the upper boundary of the study section. Riparian vegetation is in a degraded condition. On July 8, 1987, a discharge of 0.28 cfs was measured. The overall habitat condition rating was 14 (fair) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The study section was located southeast of Oakley approximately 22 km, T16S,R22E,S8,NW1/4SE1/4, on BLM land.

Fish sampled. No fish were collected while electrofishing 46 m of Emery Creek below the apparent migration barrier or in 33 m of stream sampled above the barrier.

Spawning habitat. Spawning habitat is limited due to the sediment load and the general large size of the substrate.

Factors limiting fish production. Due to the drought, it was difficult to assess average conditions present at Emery Creek. However, livestock grazing practices have definitely had a deleterious effect on the riparian ecosystem. Cutthroat trout are the native species to this small drainage.

Location of habitat degradation. The Emery Creek drainage is in a degraded state and appears to be primarily associated with grazing practices. Spring flows and seasonal freshets probably exacerbate the situation.

Recommendations for improvement. The allotment management plan encompassing this drainage needs reevaluation, particularly the topic of livestock **grazing.**

Uniqueness. Emery Creek is another drainage formerly inhabited by the Yellowstone cutthroat trout.

Fall Creek

General. Fall Creek is a third order tributary to Trapper Creek, originating near Trout Creek Mountain in the Cassia Division of the Sawtooth National Forest approximately 27 km southwest of Oakley. Fall Creek is typically of moderate gradient, possesses limited pool habitat, and has a well-developed riparian zone. Artificial instream fish habitat structures have been placed in Fall Creek by USFS personnel to create pools. Small springs emerge throughout the drainage. On June 30, 1987, a discharge of about 18 cfs was measured. The overall habitat condition rating was 22 (excellent) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The study section was accessed up the Trapper Creek road heading southwest of Oakley. The area was situated about 160 m above the confluence with Trapper Creek on USFS land, T15S,R20E,S21,NW1/4SW1/4.

Fish sampled. While electrofishing 32 m of Fall Creek, 9 rainbow trout, 74 sculpin, and 7 longnose dace (Rhinichthys cataractae) were collected. Trout averaged 95 mm in length and ranged from 62 mm to 155 mm (Figure 5). A population estimate of 284 rainbow trout/km ± 0 was estimated for Fall Creek.

Spawning habitat. Spawning areas for trout are sufficient with minimal sediment present. Water velocities appear adequate to flush sediment from important spawning locations.

Factors limiting fish production. The general lack of pools is a noticeable limiting factor for trout.

Location of habitat degradation. **Fall Creek** was generally in excellent condition throughout its length; however, some degradation to spring areas was noted due to livestock congregating for water. Some minor road encroachment has occurred due to grading with heavy machinery.

Recommendations for improvement. No specific recommendations are being made at this time.

Goose Creek

General. Goose Creek originates along the east slope of Deadline Ridge in the Cassia Division of the Sawtooth National Forest approximately 43 km south of the town of Hansen. From the headwaters, Goose Creek flows south into Nevada, turns east, and then flows through northwest Utah before reentering Idaho. In Idaho, Oakley Reservoir is the only impoundment on Goose Creek. Below the reservoir, Goose Creek is perennially dry and no longer flows directly into the Snake River. Most of Goose Creek is bordered by agricultural lands.

Upper Goose Creek typically flows through a V-shaped valley vegetated with sagebrush, quaking aspen, and Douglas Fir. Riparian vegetation is typically in good condition. The stream channel is wide and shallow and appears scoured by flood waters, leaving little cover for trout. Beaver dams are scattered throughout the upper drainage. On July 15, 1987, Goose Creek was discharging about 2.4 cfs. The overall habitat condition rating for this headwater study section was 21 (excellent) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The Goose Creek headwaters were accessed by traveling south from the town of Hansen along the Rock Creek Road, then south on the Deadline Ridge Road to the Winecup Creek/Goose Creek roads. Several unnamed primitive roads were used to reach the study section, T15S,R19E,S31,NE1/4SE1/4, on USFS land.

Fish sampled. While electrofishing 47 m of Goose Creek, 3 cutthroat trout, 2 speckled dace, and numerous cottids were collected. Trout ranged from 109 mm to 113 mm in length, and a population estimate of 64 cutthroat trout/km ± 0 was derived. The density estimate of trout in the sample reach was 2.0 trout/100 m^2.

Spawning habitat. Spawning habitat appears limited due to armoring.

Factors limiting fish production. Upper Goose Creek appears cover-limited, and no doubt floods have caused part of the problem.

Location of habitat degradation. Spring flooding appears to cause scouring and armoring of the stream channel.

Recommendations for improvement. Simple drop structures constructed of rock are suggested to create much needed pool habitat for cutthroat trout.

Uniqueness. A limited population of cutthroat trout is present in the headwaters of Goose Creek and should be afforded protection.

Green Creek

General. Green Creek drains the Independence Lakes atop Independence Mountain in the Albion Mountain Division of the Sawtooth National Forest. The stream is located in a steep valley vegetated with sagebrush, aspen, and conifers. Green Creek is a high gradient system with a surprisingly good pool:riffle structure and a predominantly cobble-boulder substrate. Riparian vegetation was in excellent condition and consisted primarily of willows, birch, and various grasses. Green Creek divides channel throughout its length and has an abundance of undercut bank cover and instream woody debris. Beaver activity was noted in the drainage. An irrigation diversion is located about 1 km upstream from the survey section, but no water was diverted at the time. On August 4, 1987, Green Creek was discharging 6.2 cfs. An overall habitat condition rating of 24 (excellent) was given to this study section of Green Creek, the highest score given during the 1987 survey (Table 1).Physical and water chemistry data are found in Table 2.

Accessibility. The area was located via the Cassia Creek Road southwest of the town of Elba. The study section was established approximately 1.5 km south of the USFS boundary, T14S,R24E,S11,SE1/4NE1/4.

Fish sampled. A total of 9 brook trout were collected while electrofishing 23 m of Green Creek. Trout ranged in size from 141 mm to 279 mm and averaged 190 mm (Figure 6). An average condition factor (K) of 1.2 was calculated for brook trout. A population estimate of 389 brook trout/km $\pm$ 20.9 was derived for Green Creek. The density estimate for trout in the sample reach was 15.2 trout/100 m^2.

Spawning habitat. Most of the substrate was relatively large in size but does not appear to inhibit brook trout reproduction. The substrate was relatively free of fine sediment.

Factors limiting fish production. No obvious habitat problems exist on Green Creek. Agricultural diversions could have deleterious impacts on stream resources depending on the amount of withdrawal.

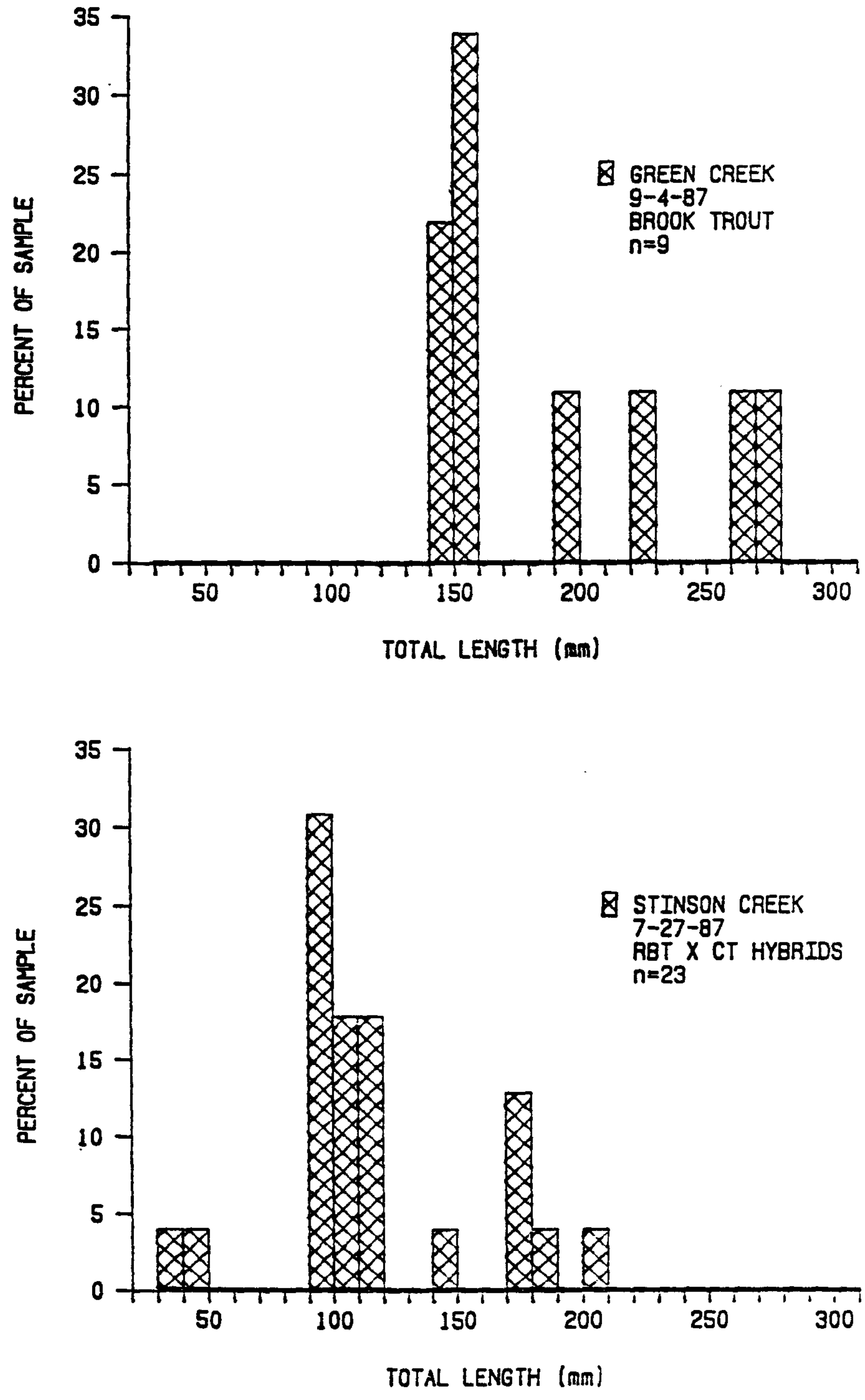


Figure 6. Length frequency diagrams of samples of trout populations collected by electrofishing Green Creek and Stinson Creek, 1987.

Location of habitat degradation. The area surveyed was in excellent condition, and no obvious degradation was observed.

Recommendations for improvement. No specific recommendations are presented to improve habitat conditions in Green Creek.

Jay Creek

General. Jay Creek, a tributary to Goose Creek, was dry on July 23, 1987. Spring seeps were present along the length of Jay Creek but not sufficient to recharge the system. All substantial springs flowing into Jay Creek are developed for livestock watering. The drainage on USFS land in Idaho was in good condition; that present in Nevada on private land was overgrazed, denuding most riparian vegetation. The area observed was T16S,R20E,S18,19,30,31. Apparently, Jay Creek once contained native cutthroat trout (Kirk Koch, BLM, personal communication).

Spring Creek

General. Spring Creek is a third order tributary to Goose Creek, originating in the Middle Mountains about 18 km south of Oakley. Spring Creek drains high, steep-sided bluffs covered with sagebrush and junipers. The stream flows through a gully with 3 to 4 m vertical sloughing banks. Riparian vegetation was virtually nonexistent at the time surveyed, and most evidence points to overgrazing. An extremely low flow of approximately 0.2 cfs was measured on July 7, 1987, and soon afterwards, the system was devoid of water. No fish were collected while electrofishing 44 m of stream.

The area surveyed was accessed off the Goose Creek Road on BLM land, T15S,R22E,S32,SW1/4NW1/4. Spring Creek received an overall habitat condition rating of 8 (poor) (Table 1). Physical and water chemistry data are found in Table 2. Cutthroat trout are native to the drainage.

Stinson Creek

General. Stinson Creek is a third order tributary of Cassia Creek, originating in the Albion Mountain Division of the Sawtooth National Forest about 8 km west of Elba. The stream flows through a steep-sided valley with dense stands of aspen and Douglas fir. Riparian vegetation was in poor condition due to livestock use. Upland vegetation was also in marginal shape. Instream fish habitat was abundant in the form of deep pools, debris jams, and boulders. Stinson Creek is somewhat buffered from extreme bank damage because of the armored nature of streambanks; however, continued overgrazing would certainly change the situation to the detriment of the present fishery. The stream exhibits some channel scour due to high water. Substrate is primarily cobble-boulder in size. Some beaver activity was noted in the area. An irrigation diversion is located about 1 km below the study section. On July 27, 1987, Stinson Creek was discharging about 1.8 cfs. The overall habitat condition rating was 16 (fair) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. Stinson Creek was accessed west of Elba and is located immediately south of the Hereford Pastures. The study section was located on USFS land, T14S,R23E,S5,NE1/4NW1/4.

Fish sampled. While electrofishing 70 m of Stinson Creek, 25 cutthroat trout and 3 brook trout were collected. All except one of the cutthroat trout exhibited evidence of hybridization with rainbow trout. Trout hybrids averaged 116 mm in length and ranged in size from 35 mm to 206 mm (Figure 6). A population estimate of 380 hybrid trout/km ± 18 was calculated for Stinson Creek. The density estimate for trout in the smaple reach was 15.7 trout/100 m^2.

Spawning habitat. Spawning sites are typically in good condition. Successful natural reproduction obviously occurs.

Factors limiting fish production. Future bank stability is questionable if riparian vegetation is not allowed time to reestablish. Due to the lack of overhanging bank cover, water temperatures in late July were greater than 20°C.

Location of **habitat degradation.** Extremely dry conditions present in the area in 1987 probably compounded typical problems associated with livestock use in riparian ecosystems. However, proper management of drainages should incorporate such extreme situations into allotment management plans and restrict grazing if necessary.

Recommendations for improvement. Manage the riparian area to allow for restoration of vegetation.

Trail **Creek**

General. Trail Creek is a fourth order tributary to the Big Wood River, originating in the Boulder Mountains. Trail Creek typically flows through an extremely steep-sided canyon vegetated with conifers, aspen, and sagebrush. The floodplain and riparian are primarily vegetated with cottonwood, aspen, willows, and birch. Substrate ranges from gravel to cobble-boulder in size. Trail Creek is a fairly high gradient system. The lower reaches are mostly diverted for municipal and recreational purposes. Tremendous residential development of the floodplain has occurred during the past 20 years. Beaver activity occurs throughout the drainage. On August 11, 1987, Trail Creek was discharging an estimated 57 cfs. The overall habitat condition rating was 19 (good) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The study section was located approximately 5 km northeast from the Sun Valley traffic light up the Trail Creek Road on USFS land, T5N,R18E,S27,NW1/4SW1/4.

Fish sampled. While electrofishing 76 m of Trail Creek, 7 hatchery origin rainbow trout, 3 wild rainbow trout, 2 brook trout, and 48 Wood River sculpin (Cottus leiopomus) were collected. A population estimate of 265 trout/km ± 80 was calculated for Trail Creek. The density estimate for trout in the sample reach was 3.5 trout/100 m^2.

Spawning habitat. The substrate has been armored to a large degree, thus limiting its usefulness as optimal spawning habitat for trout species.

Factors limiting fish production. A good pool:riffle structure is generally not present in Trail Creek due to the relatively steep gradient. The general lack of holding cover for trout possibly limits their overall survival.

Location of habitat degradation. Annual flood events have caused bank and channel instability.

Recommendations for improvement. No specific recommendations are being made to improve existing conditions at Trail Creek.

Trout Creek

General. Trout Creek is a tributary to Goose Creek, originating in the southcentral section of the Cassia Division of the Sawtooth National Forest. A number of springs which feed the stream have since been developed for livestock watering. Uplands are well vegetated by sagebrush, aspen, and conifers, while riparian vegetation was fairly well developed. Watercress (Rorippa sp.) exists near spring outlets. Beaver activity is prevalent in the drainage. Trout Creek was dry at Badger Gulch crossing but possessed ample flow approximately 1.5 km downstream. Sloughing banks occur throughout the system and contribute to the sediment load. On June 23, 1987, a discharge of about 1.0 cfs was measured in Trout Creek. The overall habitat condition rating was 20 (good) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The study site was reached by traveling southwest from Oakley on the Trapper Creek Road to Badger Gulch, then south on the Piney Cabin Road for approximately 4 km to an unnamed road which then drops down into the valley which Trout Creek drains. The section was located on USFS land, T16S,R19E,S12,SW1/4NE1/4.

Fish sampled. While electrofishing about 110 m of Trout Creek, 14 cutthroat-like trout were collected. All but one of the trout was obviously a rainbow x cutthroat hybrid. Hybrids averaged 166 mm in length and ranged from 91 mm to 226 mm (Figure 7). A population estimate of 547 trout/km ± 136 was calculated for Trout Creek. The density estimate for trout in the sample reach was 33.3 trout/100 m^2.

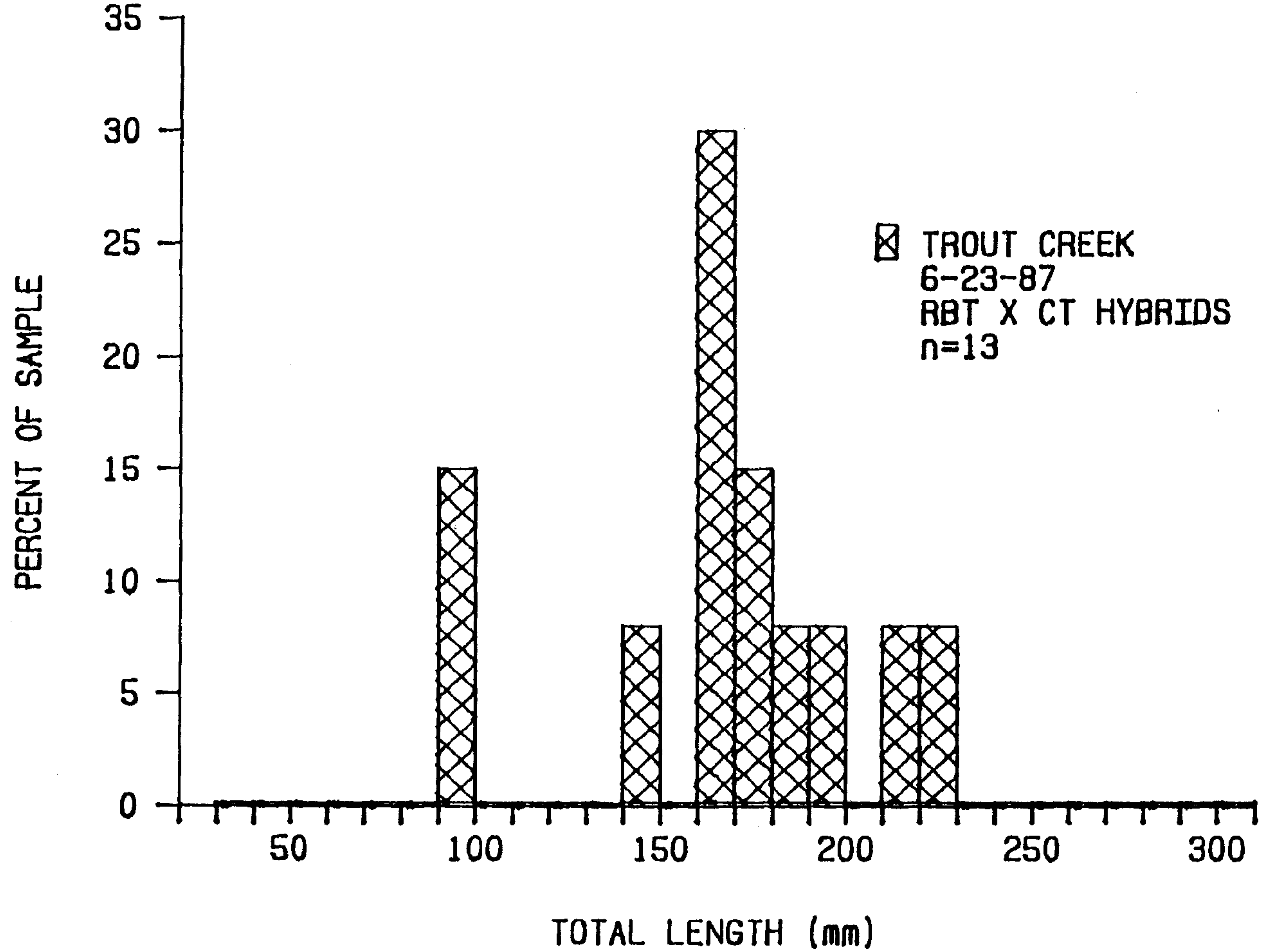


Figure 7. Length frequency diagram of a sample of the trout population collected by electrofishing Trout Creek, 1987.

Sampling performed during July 1952 at a location on Trout Creek approximately 1.6 km above the confluence with Goose Creek in Nevada suggested an abundance of nongame fish (what was described as suckers and shiners). However, Nevada fishery personnel noted the presence of cutthroat trout in the drainage and recommended against the introduction of rainbow trout. Collections made in Idaho during August 1956 included both hatchery and wild rainbow trout, so it appears Nevada Fish and Game's recommendation went unheeded.

Spawning habitat. Spawning gravels were generally in fair shape; however, past watershed abuses have rehabilitated slowly.

Factors limiting fish production. Past deterioration of the Trout Creek watershed was primarily attributed to severe overgrazing. The poor condition of this watershed resulted in an increased susceptibility to flood damage. The regional fishery biologist toured the drainage in October 1986 and felt the area was overgrazed, but USFS personnel attributed the problem to severe floods. During this survey, the allotment was being rested from livestock use and was in improving condition.

Cutthroat trout have declined in abundance, and the genetic integrity of the population compromised following introduction of rainbow trout in the mid-1950s by Idaho Department of Fish and Game personnel.

Recommendations for improvement. Continue to allow rehabilitation of the riparian zone and leave beaver which have recolonized the drainage **undisturbed.**

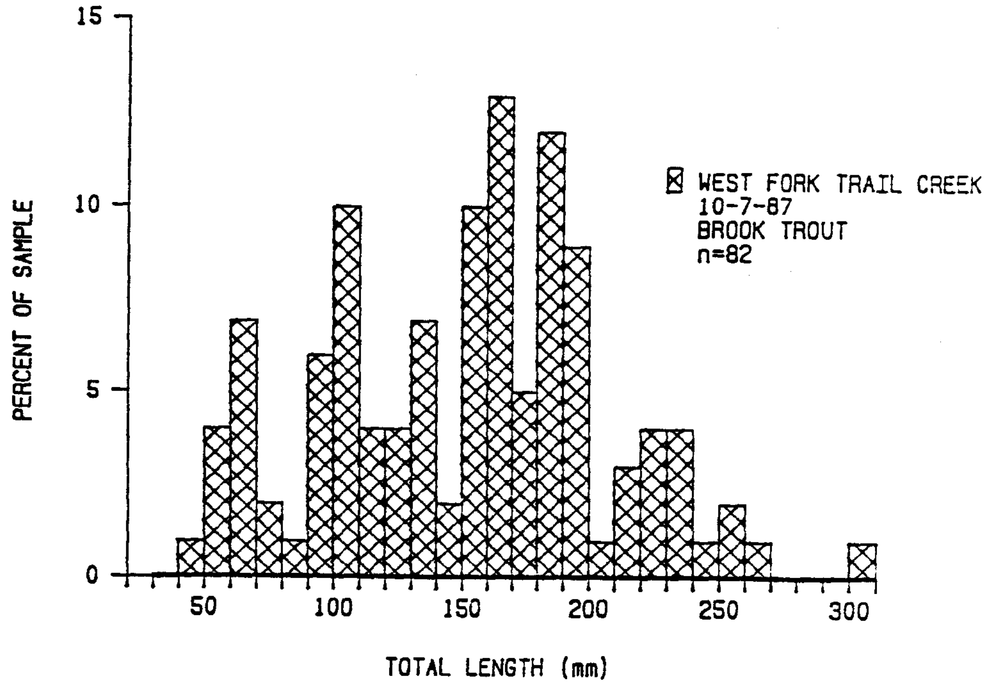
West Fork Trail Creek

General. The West Fork Trail Creek is a second order tributary of Trail Creek, originating in the Boulder Mountains north of Ketchum. The creek flows through a deep V-shaped canyon which drains steep conifer-covered slopes. Beaver are present in the drainage. A waterfall located on main Trail Creek below the confluence with the West Fork most likely prohibits upstream fish movements. This particular drainage includes a USFS domestic sheep allotment.

On October 6, 1987, West Fork Trail Creek was discharging approximately 12.4 cfs. The overall habitat condition rating was 11 (poor) (Table 1). Physical and water chemistry data are found in Table 2.

Accessibility. The study section was accessed directly north of Ketchum along the Trail Creek Road. Park Creek Road allows access to the West Fork. The study was located on USFS land, T6N,R18E,S22,NW1/4NW1/4.

Fish sampled. A total of 82 brook trout and 15 wild rainbow trout were collected while electrofishing 97 m of the West Fork. Brook trout ranged in length from 45 mm to 305 mm in length and averaged 160 mm (Figure 8). A population estimate of 913 brook trout/km ± 25 was derived. Rainbow trout averaged 156 mm and ranged from 50 mm to 292 mm in



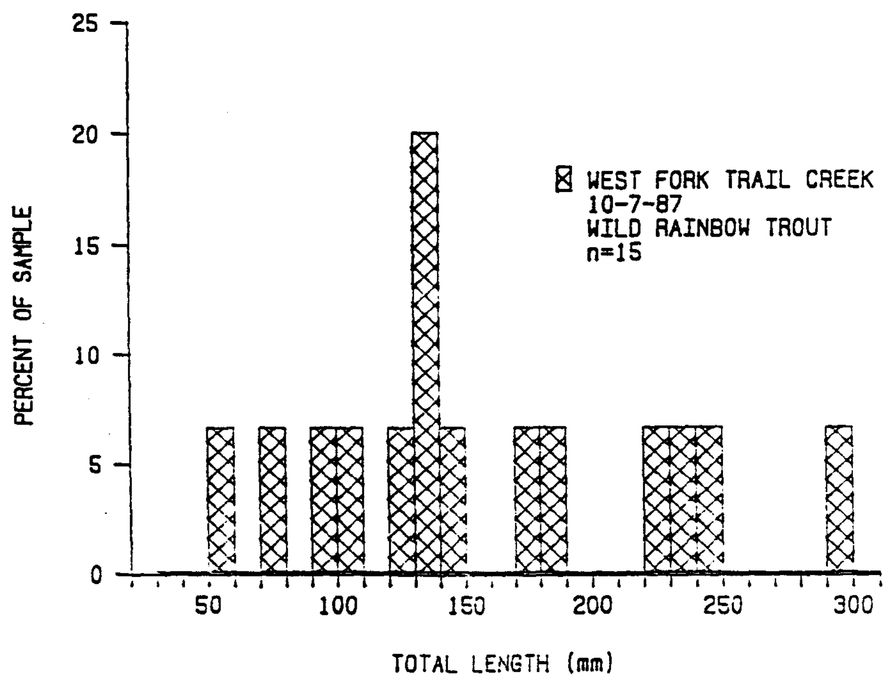


Figure 8. Length frequency diagrams of samples of trout populations collected by electrofishing West Fork Trail Creek, 1987.

length (Figure 8). A population estimate of 54.5 rainbow trout/km ± 10 was derived. All trout were in excellent condition. Density estimates for brook trout and rainbow trout in the sample reach were 23.8 and 1.4 fish/100 m^2, respectively.

Spawning habitat. Spawning habitat was in fair to good condition, with a minimum of sediment deposition. Brook trout redds were observed above the study section.

Factors limiting fish production. The almost total removal of riparian vegetation from streambanks has resulted in erosional problems and bank instability. Instream woody debris appeared to concentrate fish; however, debris was not prevalent and may act to limit fish numbers. Undercut streambanks have been significantly damaged on the West Fork by sheep.

Location of habitat degradation. During the summer of 1987, overgrazing of this allotment by sheep almost totally denuded riparian vegetation. Vegetation was nearly cropped to sod in most instances and streambanks were in the process of sloughing. Organic enrichment of the system resulted in dense growths of filamentous algae on the substrate.

Recommendations for improvement. Dry weather conditions occurring in 1987 understandably made ranges more susceptible to overgrazing than is normal. However, caution should be exercised under such circumstances, and conditions witnessed at the West Fork Trail Creek only emphasize this point. Grazing of sheep in this allotment must be more strictly managed to allow for rehabilitation of the drainage.

Uniqueness. The West Fork Trail Creek has a high production capacity for trout if sampling performed in 1987 is a reasonable indication.

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-12

Job No.: IV-c[2]

Title: Region 4 River and Stream Investigations -- Miscellaneous Surveys

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

Big Wood River - Richfield Canal

Rainbow trout redds were counted via helicopter on April 17, 1987 in sections of the Big Wood River and Richfield Canal below Magic Dam. A total of 115 redds were observed in 5.5 km of the Big Wood River from below Magic Dam to the Richfield Canal diversion dam. Seventeen redds were counted in the upper 0.5 km of the Richfield Canal.

On September 2-3, 1987, a total of 3,721 rainbow trout weighing 562 kg were salvaged from about 19 km of the Richfield Canal. Trout were transplanted to Magic Reservoir.

Malad River

On June 11, 1987, approximately 235 m of the Malad River near Tuttle were electrofished to assess the status of a smallmouth bass population in a river reach subjected to variable streamflows due to hydropower generation. A total of 45 bass were collected, representing three year classes. Mean annual growth increment for smallmouth bass was 68 mm. No bass greater than 280 mm in length were collected. A weighted mean relative weight (Wr) index of 93 was estimated for Malad River smallmouth bass. Total annual mortality (A) estimated for smallmouth bass ages 2 to 3 was 0.89. The possible effects of variable streamflows on smallmouth bass populations are discussed.

Niagara Springs Creek

Ninety-one rainbow trout were collected while electrofishing 91 m of Niagara Springs Creek on July 16, 1987. Over 501 of the sample was composed of sub-100 mm long rainbow trout. Both spring and fall spawning rainbow trout are present in the system.

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OBJECTIVE

To maintain information for fishery management activities and decisions for rivers and streams.

RECOMMENDATIONS

1. Continue salvage operations as needed of the Richfield Canal if the desired management direction is for larger trout.

2. Continue to monitor smallmouth bass in the Malad River below the Ravenscroft Ranch hydropower facility to assess status of population following revised flow regime.

TECHNIQUES USED

Rainbow trout redds were counted via helicopter on April 17, 1987 in sections of the Big Wood River and Richfield Canal below Magic Dam. Specific areas surveyed were an approximate 5.5 km of the Big Wood River beginning immediately below the tailrace pool and proceeding downstream to the Richfield Canal diversion dam. The upper 0.5 km of the Richfield Canal was also surveyed for rainbow trout spawning activity.

Fish salvage activities were conducted on September 2-3, 1987 in sections of an approximate 19 km reach of the Richfield Canal beginning immediately below the main diversion dam. Rainbow trout were collected with electrofishing gear from pool areas. Trout were counted, loaded into a hatchery truck, and transplanted to Magic Reservoir.

Two sites on the Malad River near the town of Tuttle were electrofished on June 11, 1987 to assess the status of the smallmouth bass population in a river reach subject to fluctuating flows due to hydropower generation at the Ravenscroft Ranch Project (FERC No. 4055-002). A total of 235 m of river were sampled on the Slatter and Ravenscroft Ranch properties.

Techniques used in the assessment of age and growth, population indices and mortality are described in Job b of this report.

RESULTS

<u>Big Wood River - Richfield Canal</u>

A total of 17 rainbow trout redds were observed in the upper 0.5 km of the Richfield Canal, while 115 rainbow trout redds were counted in the Big Wood River from below the Magic Dam tailrace pool downstream to the Richfield Canal diversion dam.

A total of 3,721 rainbow trout weighing approximately 562 kg were salvaged from about 19 km of the Richfield Canal.

Malad River

A total of 45 smallmouth bass were collected by electrofishing 235 m of the Malad River. Bass averaged 152 mm in length and ranged from 68 mm to 226 mm (Figure 1).

Smallmouth bass sampled by electrofishing gear in 1987 were represented by year classes 1984-1986 (Table 1). Back-calculated annual growth increments averaged 68 mm.

The PSD index was not calculated from electrofishing data because no smallmouth bass collected were 280 mm or greater in length.

Relative weights calculated for individual smallmouth bass from the electrofishing sample were closely grouped near the optimum W_r of 100 (Figure 2). Mean Wr per 50 mm length group ranged between 81 and 97, with a weighted mean W_r of 93 (Table 2).

Total annual mortality estimated for smallmouth bass ages 2 to 3 was 0.89 (Figure 3).

Niagara Springs Creek

Ninety-one wild rainbow trout were collected while electrofishing approximately 91 m of Niagara Springs Creek. Wild trout averaged 108 mm in length and ranged from 18 mm to 300 mm (Figure 4). Additionally, nine hatchery-origin rainbow trout were collected from the same reach. Fifty percent of the wild rainbow trout collected were less than 100 mm in length.

DISCUSSION

Big Wood River - Richfield Canal

Spawning by rainbow trout in the Big Wood River below Magic Dam is significant and warrants considerable attention should reconsideration be given to retrofitting Magic Dam for hydropower-generating purposes. A suitable flow regime should be recommended which would not seriously impact the habitat currently available for various life history stages of rainbow trout. Habitats preferred by the various life history stages of rainbow trout and suitability of use graphs constructed for physical habitat parameters for the species were adequately reported by Raleigh et al. (1984).

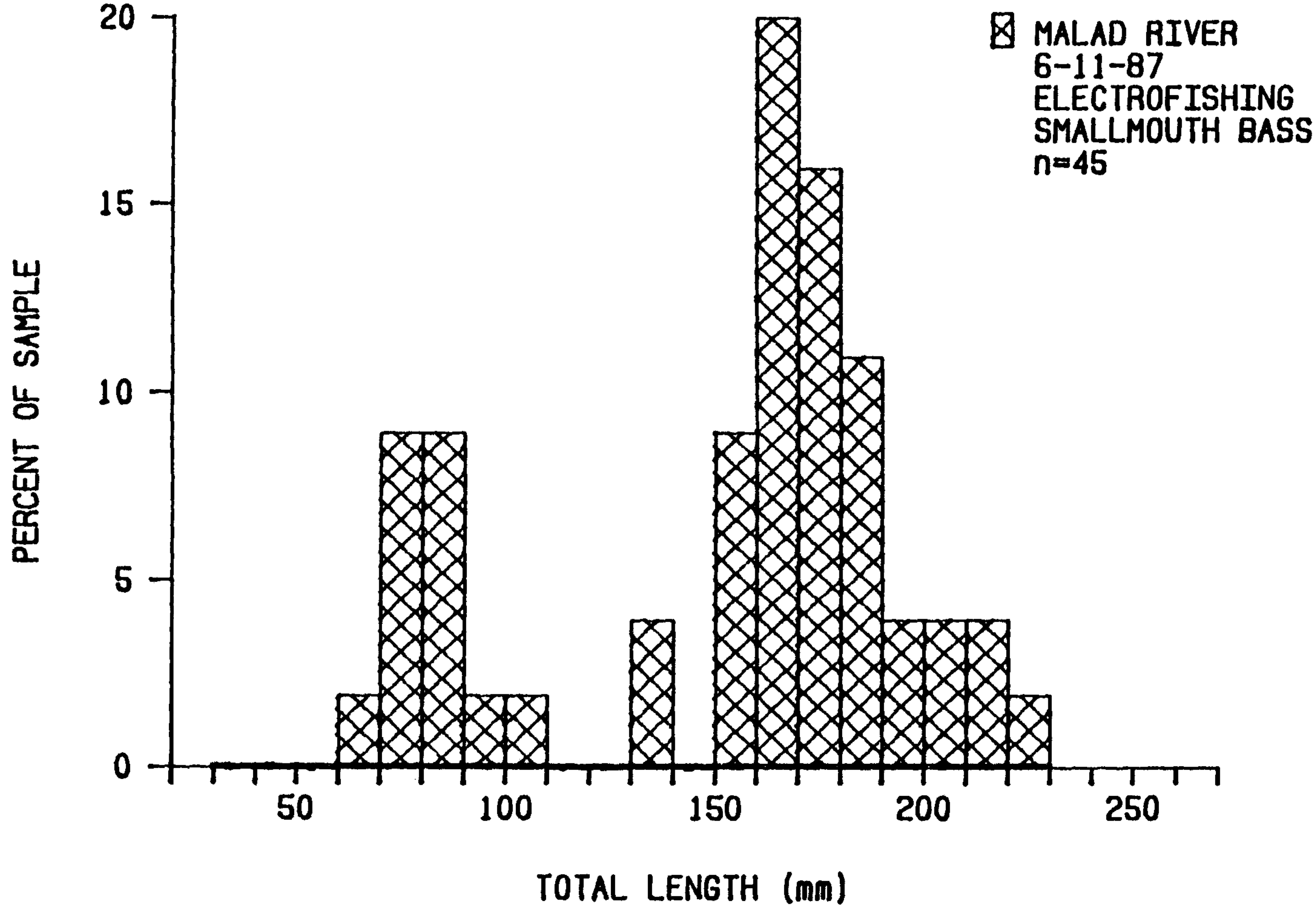

Figure 1. Length frequency diagram of a sample of smallmouth bass collected by electrofishing the Malad River near Tuttle, Idaho, 1987.

Table 1. Back-calculated lengths (mm) at age for a sample of smallmouth bass collected by electrofishing the Malad River near Tuttle, Idaho, 1987. Correction factor used in the analysis was 35 mm. Standard deviations in parentheses.

Age class	Year class	Number of fish	Mean length at capture	Mean length at annulus 1	Mean length at annulus 2	Mean length at annulus 3
I	1986	11	82	62 (6.6)		
II	1985	29	171	84 (9.2)	154 (16.8)	
III	1984	4	214	78 (10)	153 (20)	205 (10.4)
Number of fish		44		44	33	4
Weighted mean length				78	154	205
Increment of growth				78	76	51

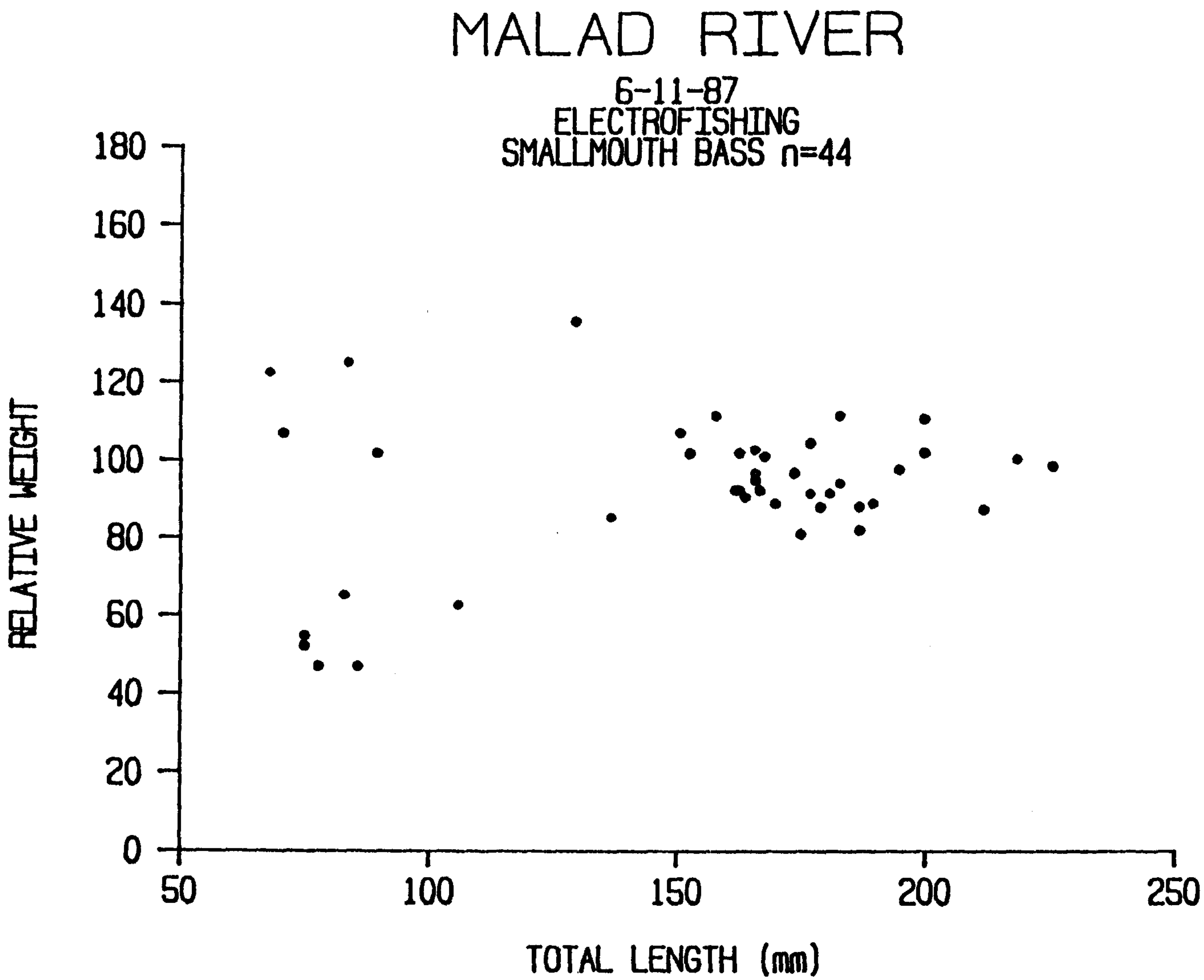

Figure 2. Plot of relative weights (W_r) of individual smallmouth bass collected by electrofishing the Malad River near Tuttle, Idaho, 1987.

Table 2. Mean relative weights (Wr) per 50-mm length group for smallmouth bass sampled by electrofishing the Malad River near Tuttle, Idaho, 1987.

Length group (mm)	Number	Mean relative weight (W_r)
51-100	10	81
101-150	3	95
151-200	29	97
201-250	3	95

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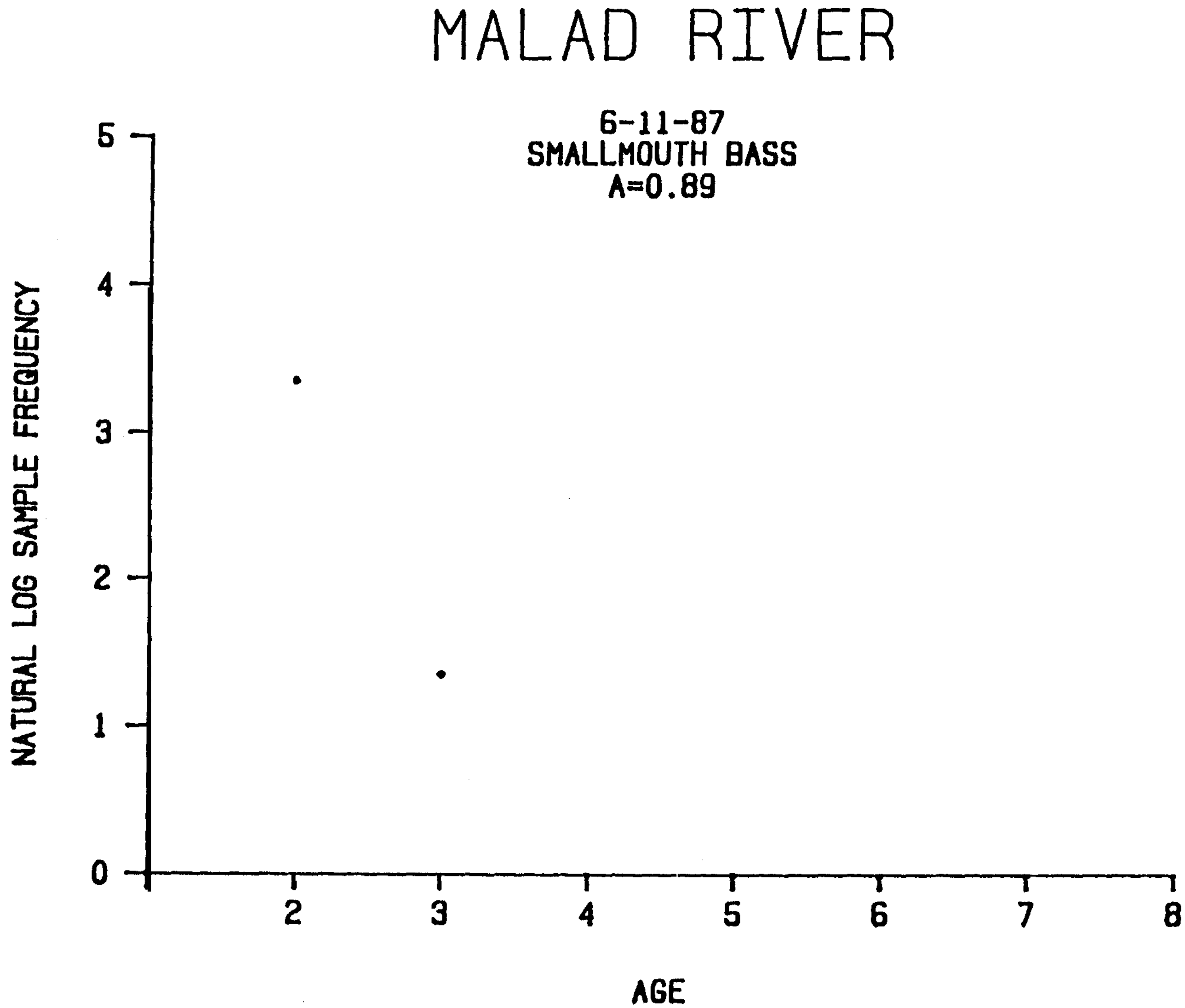

Figure 3. Catch curve generated from electrofishing data for smallmouth bass sampled from the Malad River near Tuttle, Idaho, 1987.

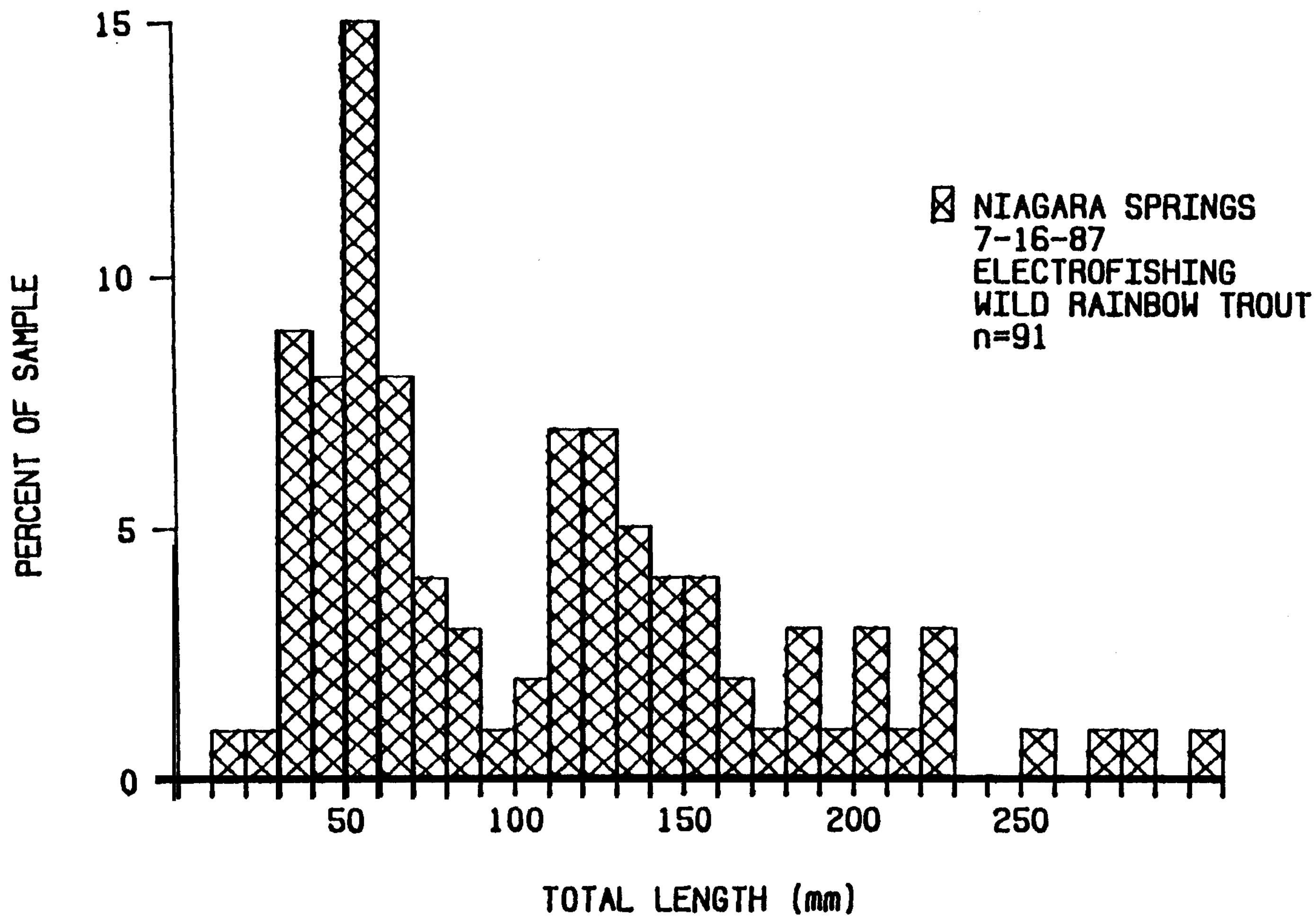

Figure 4. Length frequency diagram of a sample of rainbow trout collected by electrofishing Niagara Springs Creek, Idaho, 1987.

Historically, the Richfield Canal commonly produced rainbow trout in excess of 3.6 kg and occasionally surpassed 4.5 kg in weight. Salvage operations were conducted on the canal annually from 1949 to 1970. During this time span, the average weight of trout salvaged was between 0.7 kg and 0.9 kg (R.J. Bell, IDFG, personal communication). Salvage was not performed during 1971-1972 but was resumed during the years 1973, 1976, 1977, and 1979. The average weight of trout salvaged during these four operations was generally less than reported in past salvages. However, no salvages were conducted in the Richfield Canal from 1980-1986. Average weight of rainbow trout collected in 1987 was 0.15 kg, far below previously recorded average weight for the canal system. Only one trout exceeded 2.2 kg.

From past experience, salvage operations appeared to have a direct effect on growth and average weight of trout (R.J. Bell, IDFG, personal communication). Annual salvage of this population decreased overall density of trout, leading to superior growth rates of fish left remaining in the canal. Typically, trout of 2.2 kg or greater in weight were a common component of the overall catch. Since 1973, sporadic salvage of the Richfield Canal has occurred; and consequently, it appears increased trout densities may have resulted in reduced growth rates. Salvage operations have apparently been the dominant density control mechanism. Increased angler utilization should be encouraged.

Malad River

Although smallmouth bass present in the Malad River near Tuttle exhibit growth rates comparable to other Idaho populations, some factor limits survival and longevity of this riverine stock. Only three year classes of bass were collected, with the largest fish being 226 mm long. It is suspected variable streamflows have a definite deleterious effect on smallmouth bass in the Malad River. Water withdrawals from the system for irrigation and hydropower-generating purposes often result in severely reduced flows. Since 1984, there were two distinct periods of several weeks when essentially no flow was in the Malad River. These were December 1984 to February 1985, and October 1987 to January 1988 (V. Ravenscroft, Ravenscroft Ranch, personal communication). The minimum bypass flows currently required of the Ravenscroft Ranch hydropower facility are 5 cfs during July through mid-April and 80 cfs for the mid-April through June time periods. These flows were established through negotiations to minimize negative impacts to fish and wildlife resources. However, it is apparent that smallmouth bass are not thriving as a result of the 5 cfs bypass flow during an 8 1/2 month period of each year.

Paragamian and Wiley (1987) demonstrated that streamflow variations in the Maquoketa River, Iowa, indirectly affected growth of age 1 smallmouth bass. They postulated that streamflow variation had a direct negative impact on macroinvertebrate production, a primary component of the diet of young smallmouth bass. Older smallmouth bass are less reliant on this food source and tend to consume a wider variety of prey, including crayfish and fish (Scott and Grossman 1973). Variations in streamflow can cause changes in invertebrate abundance, production, and species composition (Cushman 1985). During low flow periods in the Malad River, much of the stream reach affected may be unavailable as cover for young smallmouth bass or for the production of invertebrates. Additionally, low flows limit habitat available for older bass and forage species. Conversely, exceptionally high flows may reduce invertebrate production through scouring (Powell 1958; Elwood and Waters 1969).

In 1987, the exemptee of the Ravenscroft Ranch hydropower project applied to the Federal Energy Regulatory Commission (FERC) for expansion of the existing facility. Under the revised terms and conditions negotiated between Idaho Fish and Game and the applicant, a higher flow regime was deemed appropriate. In lieu of the 5 cfs bypass flow, 20 cfs was adopted to enhance fish and wildlife resources. The 80 cfs spring-early summer flow will remain in effect. The agreed upon discharge of 20 cfs is only 5% of the mean annual flow of the Malad River.

Niagara Springs Creek

Significant natural reproduction by rainbow trout occurs in Niagara Springs Creek as evidenced by the number of young-of-the-year sampled by electrofishing in mid-July 1987. Minimum flow recommendations for Niagara Springs Creek should take into account habitat available for adult rainbow trout during the critical spawning period. Both spring and fall spawning rainbow trout are present in Niagara Springs Creek.

ACKNOWLEDGEMENTS

Biological aides Kieran Donahue and Larry Barrett assisted with stream surveys.

We thank the following people for additional support: Jerry Baltazor, Rod Thomas, Al Van Vooren, Vernon Ravenscroft, Bill Harryman, and the many Department and non-Department folks who assisted with the Richfield Canal salvage.

We especially would like to thank Joyce Page and Brenda McDonald for all their hard work in putting this report together.

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JOB PERFORMANCE REPORT

State of: **Idaho**

Name: **REGIONAL FISHERY MANAGEMENT INVESTIGATIONS**

Project No.: **F-71-R-12**

Job No.: **IV-d**

Title: **Region 4 Technical Guidance**

Period Covered: **July 1, 1987 to June 30, 1988**

ABSTRACT

Technical guidance was provided to state and federal agencies and private individuals by Region 4 fishery management personnel. Included in this guidance work were comments on 127 documents.

Approximately 100 man days were spent in corresponding, reviewing, attending meetings, and making field inspections of proposed and existing hydropower sites. Totals of 38 independent hydro plants were generating power in Region 4 by April 22, 1988. This brought the total power production of the independent plants to approximately 43.25 MW. Four more plants will be in operation by the end of the summer, which will increase the amount of power generated to about 69.45 MW.

Numerous miscellaneous activities were commented on or participated in and many meetings regarding fisheries and wildlife were attended.

Authors:

Robert J. Bell, Regional Fishery Manager
Scott A. Grunder, Regional Fishery Biologist

OBJECTIVES

1. To furnish technical assistance, advice, and comments to other agencies, organizations, or individuals regarding any items, projects, or activities associated with, or that may have an impact on, the fishery resource or aquatic habitat of the Region.

2. To comment upon environmental impact statements, environmental analysis reports, discharge permits, and proposed or existing hydropower projects or similar items. To participate in the Department of Fish and Game's fish and wildlife resource planning.

RECOMMENDATION

Technical guidance and assistance related to the fishery resource of Region 4 should be continued on an annual basis.

TECHNIQUES USED

Reviews, field inspections where necessary, comments, expertise, advice, and recommendations were furnished upon request to all governmental and private organizations and individuals. Numerous meetings and hearings were attended, and prescriptions were given when requested or necessary.

FINDINGS

Region 4 fishery management personnel responded to the following written requests for comments from various agencies and individuals:

Department of Water Resources	41
Environmental Protection Agency	5
Bureau of Land Management	15
U.S. Army Corps of Engineers	20
U.S. Forest Service	8
Idaho Department of Lands	10
Miscellaneous	28
TOTAL	127

Hydropower Projects

An estimated 100 man-days were spent in corresponding, reviewing, attending meetings, and making field inspections of proposed and existing hydropower projects. A total of 38 independent hydro plants were generating power in Region 4 by April 22, 1988, making the approximate maximum power production at about 43.25 MW. By the end of the summer, four more plants will be put into operation. These are all on irrigation canals and will produce a combined total of 26.2 MW which will raise the total power produced in the Region to approximately 69.45 MW. By the end of 1988, the 9 MW Magic Dam Hydro Project is scheduled to be completed, raising the maximum power production to roughly 78.45 MW.

As in previous years, numerous violations of terms and conditions occurred on some of the hydro projects during the year. All violations detected were documented and reported to the Fisheries Bureau, who in turn, reported them to the FERC.

MISCELLANEOUS ACTIVITIES

1. As in 1986, we continued our investigation of Cow Creek Reservoir as a possible Department of Fish and Game purchase. The reservoir will be managed as a trophy trout water if it is obtained. The demand for this type of water in Region 4 is extremely high at the present time.

2. Assisted Division of Environmental Quality personnel on the Rock Creek Rural Clean Water Project. As in previous years, we electrofished and assessed fish populations in the stream.

3. We continued work on several other interagency cooperative projects, including Cedar Draw Creek Clean Water Project, the Sublett Reservoir and tributaries work, and the Vinyard Creek Project.

Submitted by:

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